CITY & COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS
BUREAU OF ENGINEERING

Bayside Facilities Planning Phase 3

ATTACHMENTS

ISLAIS CREEK PUMP STATION AND SOUTHEAST WATER POLLUTION CONTROL PLANT IMPROVEMENTS

AMENDMENT TO THE CROSSTOWN PROJECT REPORT
BAYSIDE FACILITIES PLAN (MARCH 1982)

JANUARY 1991

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ATTACHMENTS

1 - "REQUEST FOR AMENDMENT TO CEASE AND DESIST ORDER 88-105 TO ALLOW FOR THE DISCHARGE OF SECONDARY EFFLUENT TO ISLAIS CREEK DURING WET WEATHER," CLEAN WATER PROGRAM

2 - EXCERPT OF "ISLAIS CREEK PUMP STATION PROJECT, SOUTHEAST WATER POLLUTION CONTROL PLANT, SITE HISTORY REVIEW," GEO/RESOURCE CONSULTANT INC., DECEMBER 1989

3 - EXCERPT OF "FINAL SOIL/GROUNDWATER INVESTIGATION REPORT, ISLAIS CREEK PUMP STATION PROJECT," GEO/RESOURCE CONSULTANT INC. AUGUST 1990

4 - EXCERPT OF "PHASE II, FINAL SOIL/GROUNDWATER INVESTIGATION REPORT, ISLAIS CREEK PUMP STATION PROJECT," GEO/RESOURCE, DECEMBER 1990

ATTACHMENT 1

"REQUEST FOR AMENDMENT TO CEASE AND DESIST ORDER #88-105 TO ALLOW FOR THE DISCHARGE OF SECONDARY EFFLUENT TO ISLAIS CREEK DURING WET WEATHER," CLEAN WATER PROGRAM

REQUEST FOR AMENDMENT
TO CEASE AND DESIST ORDER 88-105
TO ALLOW FOR THE DISCHARGE
OF SECONDARY EFFLUENT
TO ISLAIS CREEK
DURING WET - WEATHER

FINAL REPORT

FEBRUARY 1990

SUBMITTED TO THE
REGIONAL WATER QUALITY
CONTROL BOARD BY
THE SAN FRANCISCO
CLEAN WATER PROGRAM
IN FULFILLMENT
OF REQUIREMENT
B.3 OF CDO 88-105

REQUEST FOR AMENDMENT TO CEASE AND DESIST ORDER 88-105 TO ALLOW FOR THE DISCHARGE OF SECONDARY EFFLUENT TO ISLAIS CREEK DURING WET - WEATHER

EXECUTIVE SUMMARY

The San Francisco Clean Water Program (Program) is submitting this request for amendments to Cease and Desist Order 88-105 in order to utilize the Quint Street Outfall for the disposal of secondary effluent during wet-weather conditions. The amendment, would allow the City to use the Quint Street Outfall as an interim measure while it completed all the facilities needed to achieve the RWQCB's requirements for CSO control.

The City currently has adequate treatment capacity and outfall (disposal) capacity to routinely achieve all Basin Plan requirements for discharging to San Francisco Bay during dry-weather conditions. The City has two offshore outfalls in San Francisco Bay with a combined capacity of 250 million gallons per day (MGD). However, during wet-weather operations, approximately 653 hours per year, the City does not have adequate offshore outfall capacity to achieve all Basin Plan requirements for effluent disposal. The City currently discharges excess treated wet-weather flow through a shoreline, surface, point discharge located on the south bank of Islais Creek at Quint Street.

At present, the City has a total Bayside wet-weather treatment capacity of 350 MGD. In order to complete the remaining Bayside projects for Combined Sewer Overflow (CSO) control, wet-weather treatment capacity will have to be increased to 390 MGD. The Quint Street Outfall has a rated capacity of 140 MGD which is adequate to handle the additional wet-weather treatment needed to achieve the RWQCB's requirements for CSO control.

The Quint Street wet-weather discharge, however, does not comply with the Basin Plan prohibition against discharges to confined waters, and discharges with less than 10:1 initial dilution (parts seawater to parts effluent). This discharge could also result in occasional violations of the RWQCB's water quality objectives for pH, ammonia and certain heavy metals.

The Basin Plan is cryptic on how the RWQCB,s objectives will be applied to wet-weather discharges. Essentially all discharges of urban runoff occur near shore in shallow water. The levels of Basin Plan Table III-2A toxicants in typical urban runoff is well documented. This data indicates that essentially <u>no shallow water discharge of urban runoff will consistently meet all Table III-2A objectives in the immediate vicinity of the discharge.</u> This is true whether the discharge is untreated, treated to primary levels, or receives full secondary treatment. Secondary treatment, as proposed here, will significantly reduce the frequency and severity of the non-attainments of objectives, but without expensive offshore deep-water outfalls, total compliance is unobtainable.

PROPOSAL

The Clean Water Program proposes to use the Quint Street Outfall only during wet-weather to discharge combined sewage effluent that has received secondary treatment. The proposed discharge of secondary effluent at Quint Street will occur an average of 48 times per year for a total duration of approximately 653 hours per year. The balance of the Southeast Water pollution Control Plant wet-weather effluent will be discharged through the Pier 80 Outfall. The Pier 80 wet-weather discharge will consist of an average of 38% secondary effluent and 62% primary effluent.

Coincident with this discharge there will also be an average of 10 wet-weather combined sewer overflows each year near the Quint Street Outfall as allowed by the NPDES Permit for the Bayside CSO structures.

The facilities needed to implement the Program's proposal are all related to the transport and treatment of combined sewer overflows (CSOs) and these facilities would be needed regardless of the decision on this amendment request.

ALTERNATIVES TO THE PROPOSAL

The alternatives to the proposal would be: a) to build additional outfall capacity to San Francisco Bay or; b) export some (or all of treated effluent to the Southwest Ocean Outfall via a 7-mile long force main or tunnel (Crosstown Transport). The least expensive Bay outfall that could meet all RWQCB's requirements would add $45,000,000 to the City's cost for CSO control. The least expensive Ocean export option (a 140 MGD force main) would add $115,000,000 to the City's costs. Costs for the major project elements for the Programs proposal, the least expensive Bay discharge alternative and least expensive Ocean discharge alternative to the Program's proposal are shown in the following Table.

BAYSIDE III FACILITIES

COST COMPARISON
DISCHARGE TO ISLAIS CREEK
VERSUS FULL COMPLIANCE

(Assumes Split-Flow @ Southeast WPCP)

	COST (in $Millions)		
Element	Quint Street Outfall	New 140 MGD Bay Outfall	140 MGD X-Town Force Main
Islais Creek Pump Station	15.91	23.31	38.35
Piping ICPS to SEWPCP	0.96	1.14	1.14
140 MGD Outfall Onshore	NA	4.54	NA
140 MGD Offshore Section	NA	18.25	NA
X - Town Force Main	NA	NA	65.74
Energy Recovery	NA	NA	2.24
Common Elements			
Capacity Mods. @ NPWPCP	0.32	0.32	0.32
Flow Redirection S/Market	0.11	0.11	0.11
Split Flow @ SEWPCP	12.06	12.06	12.06
Sub-total	29.36	59.73	119.85
	30	90	
Miscellaneous Costs			
Contingencies @ 10%	2.94	5.97	11.99
Professional Services @ 16%	4.70	9.56	19.13
Land @ Islais Creek PS	1.60	1.60	1.60
Present Worth of O&M	25.13	34.60	63.49
Salvage value (30 year)	(2.21)	(4.96)	(9.56)
Total	61.52	106.50	206.55
	45	145	

Costs are ENR 5517, Jan.-June 1987
Present day (2/90) Costs would be about 5% higher.

REQUESTED AMENDMENTS

In order to utilize the Quint Street outfall for disposal of wet-weather effluent, the RWQCB will have to issue amend Order 88-105 for the following Basin Plan requirements:

DISCHARGE PROHIBITIONS (#1)

Discharges with less then 10:1 initial dilution or discharge into dead-end slough or similar confined waters.

The Program requests that both of these requirements be waived for the term of the Order.

WATER QUALITY OBJECTIVES

pH

The pH shall not be depressed below 6.5 nor raised above 8.5....- Controllable water quality factors shall not cause changes greater than 0.5 units in normal ambient pH

There could be infrequent violations of the objective of 6.5 to 8.5 pH units. The pH of the surface discharge field may at times differ from the ambient pH by more than the allowable difference of 0.5 pH units. The Program requests alternate pH objectives of 6.0 to 9.0 pH units and an allowable difference from ambient of 1.5 pH units. The Program also requests a similar change (6.0 to 9.0 pH units) in the effluent limitations for the Quint Street Outfall.

Unionized Ammonia

The discharge of wastes shall not cause receiving waters to contain concentrations of un-ionized ammonia in excess of the following limits:

0.025 mg/l as N	*Annual Median*
0.16 mg/l as N	*Maximum (Central Bay and upstream)*
0.4 mg/l as N	*Maximum (Lower and South Bay)*

The Quint Street discharge will meet the 6 month median objective of 0.025 mg/1 as N but there could be occasional excursions over the Central Bay maximum objective of 0.16 mg/1. The Central Bay maximum objective is based on "...the protection of the migratory corridor running through Center Bay..." (1986 Basin Plan). Since Islais Creek is well removed for the migratory corridor, the Program believes the Lower Bay maximum objective of 0.4 mg/1 will provide adequate protection of beneficial uses.

EFFLUENT LIMITATIONS (BASIN PLAN TABLE IV-1)

The Program requests the following modifications to the Table IV-1 shallow water, daily-average effluent limitations:

Toxicant	Shallow Water Limitation	Requested Alternate Limitation
Cadmium	10	12
Copper	20	150
Lead	5.6	13
Nickel	7.1	8.1
Silver	2.3	15
Zinc	58	150

The above Alternate Limitations are based on the 95%-ile levels measured in the wet-weather secondary effluent over a limited number of storms during the 1988-1989 wet-weather season. The Program will be gathering additional data on wet-weather effluent characteristics during the early part of the 1989-1990 wet-weather season in order to develop better estimates of the 95%-ile levels.

The requested alternate effluent limitations for cadmium, lead, nickel and zinc will still allow the discharge to achieve the water quality objectives of Table III-2A of the Basin Plan. There is no Basin Plan objective for copper (EPA has rescinded its national ambient salt water criterion for this metal).

Based on the special effluent sampling last winter, there may be occasional violations of the Table III-2A criterion for silver.

The Program's Industrial Waste Division recently began a special monitoring program to identify and control the discharge of metals from small industrial sources(small quantity generators). The small quantity generator program is described in detail in the last section of this report.

PROTECTION OF BENEFICIAL USES

Islais Creek is a narrow, marine inlet off of San Francisco Bay located in the southeast sector of the City. With the exception of two mini-parks, the shoreline is devoted to industrial and maritime uses. Water contact recreational uses of the Creek are minimal and should not be adversely impacted as the Quint Street discharge will be disinfected. Future recreational uses are not expected to increase significantly above present levels.

Although the Quint Street discharge will not fully comply with all Basin Plan water objectives at all times, the discharge is not expected to have a noticeable adverse impact on the marine life of San Francisco Bay for the following reasons:

The discharge will be intermittent, totaling approximately 653 hours per year. The waste field will be confined to the uppermost 3 to 5 feet of the water column. The waste field will be flushed from the Creek within two days of cessation of discharge.

Any violations of water quality objectives will be confined to the low salinity waste field. Such violations would be infrequent and short lived. Resident species of fish and zooplankton will usually avoid the low salinity water in the waste field and consequently not be exposed to any toxicants at levels above their respective water quality objectives.

The whole effluent toxicity of the discharge is low. The speckled sanddab is the most sensitive tested species to the Quint Street wet-weather discharge. A No Observable Effects Level (NOEL) of 10% effluent was reported in one five-day exposure, in the second test the NOEL was 100% effluent. This species is resident in Islais Creek, however, it is a bottom dweller that would not be exposed to the surface field from the Quint Street Outfall. (Note: The toxicity testing of the wet-weather discharge is still in progress. The Program will submit a supplement to this report upon completion of this testing.)

The Quint Street discharge should not cause any violations of Basin Plan water quality objectives in Bay waters beyond the immediate the mouth of the Creek.

With the use of the Quint Street Outfall for effluent disposal, future (post-program) deposition of organic solids would be approximately one-forth of historic (pre-program) deposition at the head end of Islais Creek and approximately one-half of historic deposition in the vicinity of the Quint Street outfall.

PIER 80 OUTFALL EFFLUENT LIMITATIONS

The wet-weather discharge of the blend of primary effluent and secondary effluent through the Pier 80 Outfall is expected to fully comply with all Basin Plan Table III-2A receiving water objectives and all Table IV-1 effluent limitations for toxicants. Consequently, no modifications to the Pier 80 effluent limitations would be required to implement the Program's proposal.

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APPENDICES

* Separately Bound

FIGURES

TABLES

CEASE AND DESIST ORDER 88-105
AMENDMENT REQUEST FOR WET-WEATHER DISCHARGES AT ISLAIS CREEK THROUGH THE QUINT STREET OUTFALL

FINAL STUDY REPORT

FEBRUARY 1990

PURPOSE OF STUDY

At present, the City has two offshore outfalls with diffusers in the Bay. These outfalls achieve the Regional Water Quality Control Board's (RWQCB) requirements for a minimum initial dilution of at least 10 to 1. The North Shore Outfall has a rated capacity of 170 Million Gallons per Day (MGD) which is slightly (20%) in excess of the rated capacity of the North Point Water pollution Control Plant. With the recent completion of improvements to the Pier 80 outfall for the Southeast Water Pollution Control Plant, it now has a rated capacity of 110 MGD. This capacity is adequate to handle the Southeast Water Pollution Control Plant effluent during dry-weather, but during the approximately 653 hours per year of wet-weather conditions, flows in excess of 110 MGD outfall capacity are discharged into Islais Creek through a shoreline, surface point discharge. This discharge does not comply with the RWQCB's Basin Plan prohibitions against discharges to confined waters or discharges with the 10:1 minimum dilution.

In Cease and Desist Order 88-105 adopted June 15, 1988, the RWQCB directed the City to "Select [an] alternative to address [discharge] prohibition during wet-weather (i.e., new Bay outfall, crosstown facility, or exception request).[amendment]" The RWQCB set a deadline of May 1, 1990 for this selection. The amendment, if granted, would allow the City to use the Quint Street Outfall as an interim measure while it completed all the facilities needed to achieve the RWQCB's requirements for CSO control.

In its Basin Plan, the RWQCB indicates that they will consider granting exceptions to their discharge prohibitions where:

a) "...an inordinate burden would be placed on the discharger relative to beneficial uses protected and an equivalent level of environmental protection can be achieved by alternate means, such as an alternative discharge site, a higher level of treatment, and/or improved treatment reliability; or

b) A discharge is approved as part of reclamation project; or

c) It can be demonstrated that net environmental benefits will be derived as a result of the discharge." (RWQCB 1986)

In order to resolve the discharge prohibitions question, the Program held discussions with the RWQCB staff during the summer of 1988 to ascertain their specific information needs for evaluating such a request and submitting it for formal action. Based on these discussions, the Program developed a draft Plan of Study for the amendment (exception request) and submitted it to the RWQCB on August 25, 1988 for review. The RWQCB commented on this draft, and the Program submitted a final Plan of Study to the RWQCB on October 20, 1988. The final Plan of Study along with the RWQCB comment letter are included in Appendix A.

This amendment request study and report are consistent with the final Plan of Study, with the exception of adjustments to the station locations and collection methodology of obtaining water quality data in Islais Creek and reorganization of the report.

The following sections of the report contain information of existing and proposed collection, treatment and disposal facilities; cost comparisons between facilities needed to fully comply with the RWQCB discharge prohibitions and the facilities that could be built if an amendment is granted; environmental conditions in Islais Creek; the impacts of the effluent discharge on conditions in the Creek and recommendations for effluent limitations and water quality objectives for the Quint Street Outfall discharge.

BACKGROUND

Three key elements of the City's wastewater Master Plan developed in the 1970's were; (1) expansion of the Southeast Water Pollution Control Plant to provide secondary treatment of all Bayside dry-weather flow, (2) reduction of wet-weather combined sewer overflows (CSO) to the levels specified by the RWQCB, and (3) the eventual export of all Bayside dry-weather flow and the majority of wet-weather flow to the Ocean through a Crosstown Tunnel. The City's first priority was attainment of the Clean Water Act requirement for secondary treatment of all discharges to inland waters. Since the Southeast Water Pollution Control Plant was scheduled for completion before the proposed Crosstown Tunnel, the City constructed the Quint Street Outfall to Islais Creek to handle the effluent flows in excess of the 70 MGD capacity of the Pier 80 Outfall. Appendix F, *Crosstown Transport* provides additional information on the evolution of the Master Plan proposal for ocean export of Southeast Water Pollution Control Plant effluent, and the relationship of this amendment request to that proposal.

In February 1989, the Program completed improvements to the Pier 80 outfall system to increase its capacity to the 110 MGD level needed to handle all dry-weather flow from the Southeast Water Pollution Control Plant, thereby fully achieving the RWQCB requirements during dry weather.

However, during wet weather conditions, the Southeast Water Pollution Control Plant control currently is operated at peak-wet-weather-flow rates up to 210 MGD. With additional improvements for CSO control, the capacity of the Southeast Water Pollution Control Plant could be increased to between 250 MGD and 320 MGD. The final capacity of the Southeast Water Pollution Control Plant will depend on the economics of CSO control. These facilities are currently being evaluated as part of the Bayside III Facilities Plan.

The RWQCB's requirements for controlling combined sewer overflows (CSO) are contained in NPDES permit CA0038610 (RWQCB Order 84-28). The requirements establish yearly limitations for the average number of allowable CSOs:

Northshore Zone	4
Central Zone (Bay Bridge) through Islais Creek)	10
Southeast Zone	1

The Program has completed and is operating CSO control facilities which achieve these requirements along the Northshore area, Mission Creek (China Basin), India Basin and the Yosemite Basin. Over the next 18 months, the Program will award construction contracts for the Mariposa Basin and Sunnydale CSO control facilities. Design of the Islais Creek Transport-Storage facility will begin in the Fall of 1989. Planning is in progress for the remainder of the CSO control facilities needed to comply fully with the RWQCB requirements for CSO control. (See Figure 1).

ISLAIS CREEK FACILITIES

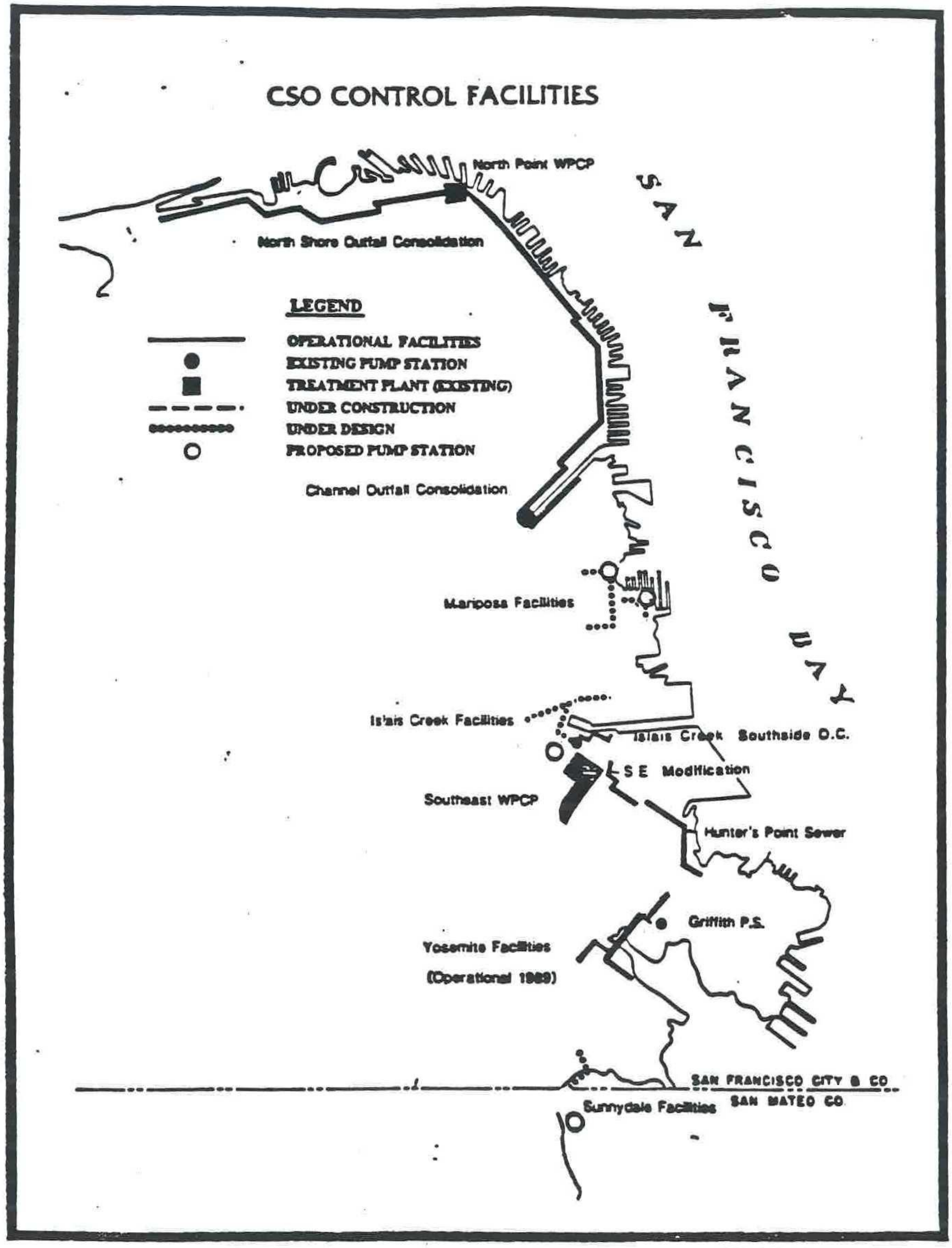
The City presently has four CSO discharges into Islais Creek. The two structures adjacent to the 3rd Street, Bridge (north 3rd Street and south 3rd Street) are relatively small and account for approximately 6 percent of the present CSO discharge to the Creek. The two major discharges are at the head end of the Creek (Marin Street and Selby Street) and account for 94 percent of the total CSO discharge. Figure 2 is a schematic of Islais Creek showing the CSO structures and Quint Street Outfall.

The Islais Creek South Side Outfalls project completed in 1978 resulted in closure of the Rankin Street CSO discharge. The Southeast Sewer Modifications project completed in 1987 provides partial CSO control for the south Third Street System.

The Program recently completed facilities planning, including environmental review, for the Islais Creek Facilities and will begin design in the Fall of 1989.

The project is a network of transport and storage facilities that in conjunction with the future Islais Creek Pump Station and the future Bayside III facilities (see Bayside III Facilities), will achieve CSO control for the remainder of the Bay shoreline. A schematic of the proposed Islais Creek Facilities is shown in Figure 3.

The design capacity of the facilities will depend on the alternative selected for the Bayside III facilities. The facilities depicted on Figure 3 will provide a total of 32,500,000 gallons of CSO storage. This capacity, coupled with an expansion of the peak-wet-weather-flow capacity of the Southeast Water Pollution Control Plant to 250 MGD will be adequate to achieve the RWQCB's CSO requirements.



CSO CONTROL FACILITIES
North Point WPCP
North Shore Outfall Consolidation
SAN FRANCISCO BAY
LEGEND
OPERATIONAL FACILITIES
EXISTING PUMP STATION
TREATMENT PLANT (EXISTING)
UNDER CONSTRUCTION
UNDER DESIGN
PROPOSED PUMP STATION
Channel Outfall Consolidation
Mariposa Facilities
Is'ais Creek Facilities
Islais Creek Southside O.C.
S E Modification
Southeast WPCP
Hunter's Point Sewer
Griffith P.S.
Yosemite Facilities
(Operational 1989)
SAN FRANCISCO CITY & CO
SAN MATEO CO
Sunnydale Facilities

FIGURE 1

ISLAIS CREEK OUTFALLS

STRUCTURE	SIZE(ft)	CAPACITY* mgd
QUINT ST. OUTFALL	12 x 6	140
NORTH 3RD ST. CSO	3.5 x 5:25	84
MARIN ST. CSO	10 x 8	710
SELBY ST. CSO	3@ 10 x 7.5	1740
RANKIN ST. CSO	5 diameter	Abandoned
SOUTH 3RD ST. CSO	4.5 diameter	65

*Peak 5 year flow for CSO Structures

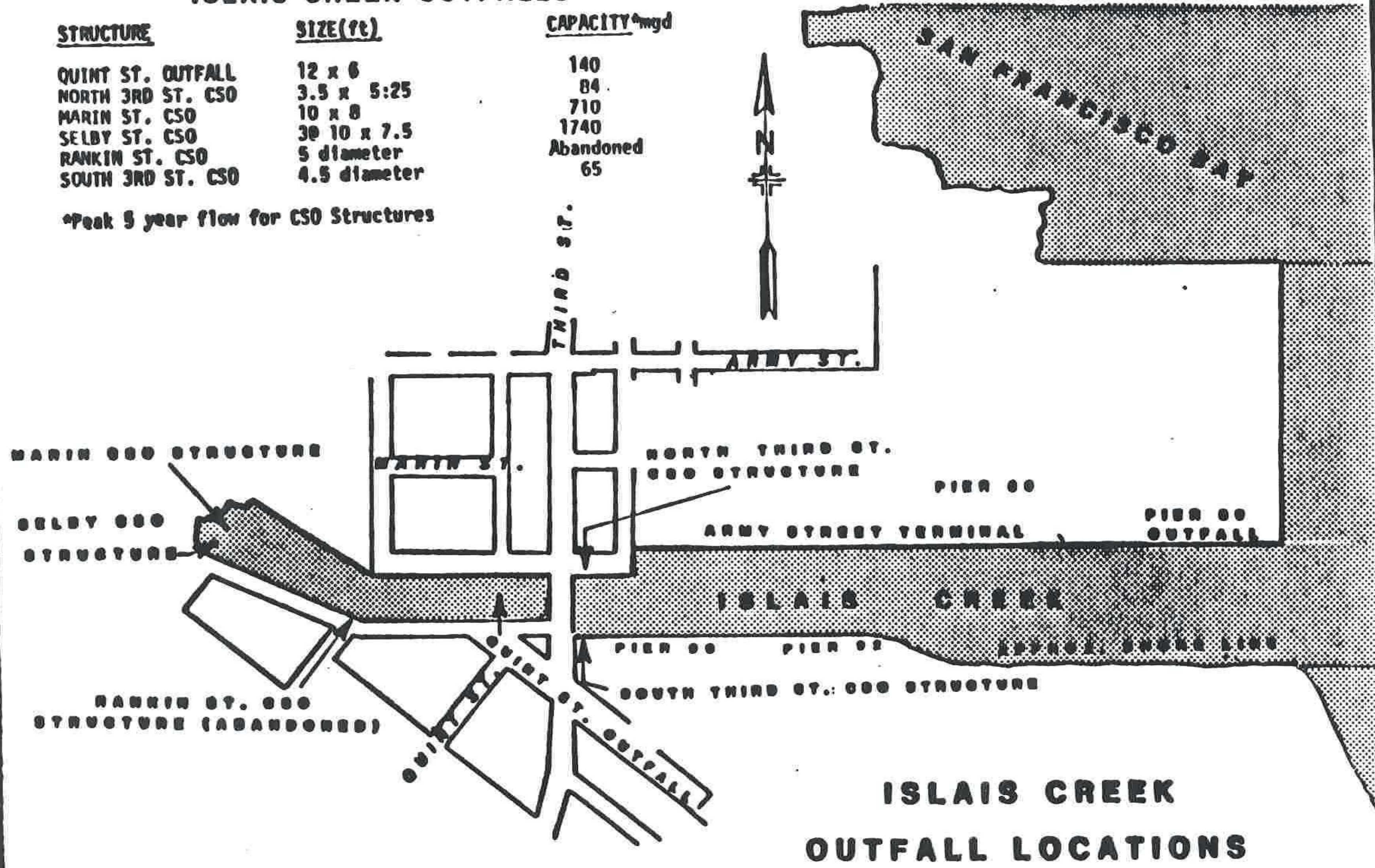


FIGURE 2

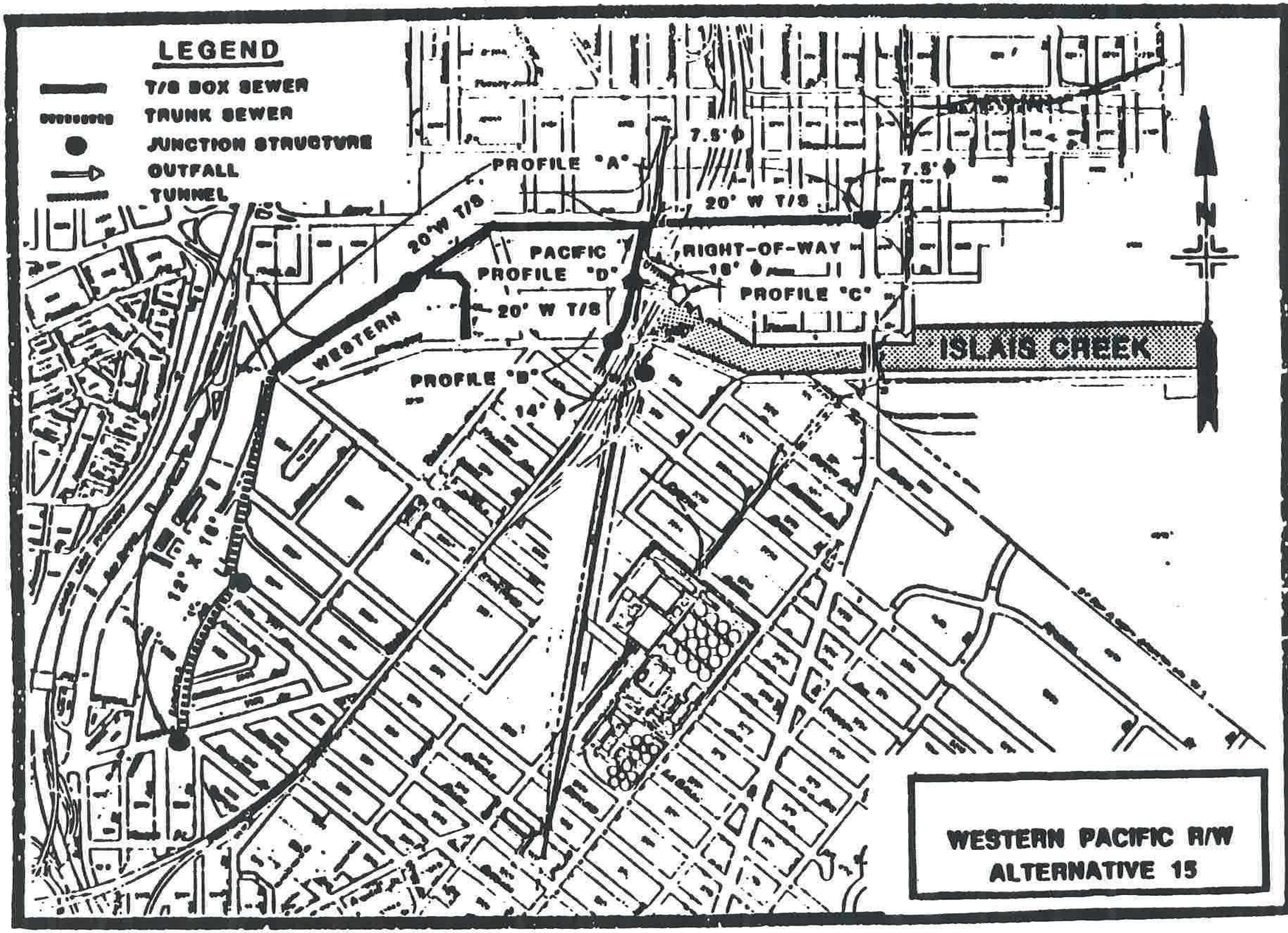

LEGEND
T/S BOX SEWER
TRUNK SEWER
JUNCTION STRUCTURE
OUTFALL
TUNNEL
PROFILE "A"
7.5' ϕ
7.5' ϕ
20' W T/S
20'W T/S
PACIFIC
PROFILE "D"
RIGHT-OF-WAY
10' ϕ
PROFILE "C"
20' W T/S
WESTERN
ISLAIS CREEK
PROFILE "B"
14' ϕ
12' X 16'
N
WESTERN PACIFIC R/W
ALTERNATIVE 15

FIGURE 3

EXISTING OUTFALLS

The City currently discharges treated effluent through the following outfalls into the Bay:

Name	Location	Design Capacity
Northpoint Outfalls	Piers 33 & 35	170 MGD
Southeast Outfall	Pier 80	110 MGD
Quint Street Outfall (Interim Outfall)	South Bank Islais Creek	140 MGD

North Point Water Pollution Control Plant Outfalls

Effluent from the North Point Water Pollution Control Plant is discharged through four 48-inch diameter outfalls, two suspended under Pier 33 and two suspended under Pier 35. This discharge occurs only during wet-weather when the Northpoint Water Pollution Control Plant is operating (approximately 450 hours per year).

These outfalls were initially constructed as offshore point discharges in 1951. The 76 foot-long diffuser sections were added in 1975. These outfalls have a total design hydraulic capacity of 170 MGD (by gravity during all tide conditions).

Minimum initial dilution through these outfalls is estimated at 10:1 for a discharge of 170 MGD, at slack water during stratified conditions. This dilution is adequate to achieve all Basin Plan water quality objectives.

Southeast Water Pollution Control Plant Outfalls

The present 54 inch diameter (offshore section) Pier 80 outfall for the Southeast Water Pollution Control Plant was built in 1967 with a rated capacity of 70 MGD. The Program replaced the original T-shaped diffuser risers with larger diameter branched risers in 1985. Modifications to the onshore section and the Booster Pump Station to increase the capacity to 110 MGD were completed in February 1989. With the recent modifications, the Pier 80 Outfall is capable of handling all Southeast Water Pollution Control Plant dry-weather effluent. Wet-weather effluent flow in excess of the 110 MGD capacity of the Pier 80 outfall is discharged by gravity through the 12 foot by 6 foot Quint Street Outfall which terminates on the south bank of Islais Creek, one block west of the Third Street Bridge. The Quint Street Outfall was built in 1980 in conjunction with the expansion of the Southeast Water Pollution Control Plant and has a rated capacity of 140 MGD.

Calculations made for the increase in capacity of the Pier 80 outfall yielded a minimum initial dilution of 18:1 during all receiving water and flow conditions. Between March 1986 and May 1987, staff of the Southeast Water Pollution Control Plant conducted dye studies on three separate dates to determine actual dilutions achieved at low slack water. Dilutions measured directly above the diffuser and 50 feet north and south of the diffuser ranged from 23:1 to 70:1, mean value was approximately 35:1. There was little difference in the results from all three tests. The 35:1 result is in good agreement with the design calculations made for average stratification conditions. (BWPC undated)

Initial dilution (as it is defined in the Ocean Plan) for the Quint Street Outfall is minimal. Dilution at points distant from this outfall is discussed in the section on Dilution and Dispersion and in Appendix D.

Southwest Ocean Outfall (SWOO)

The Southwest Ocean Outfall was completed in the fall of 1986. At present, it is used for effluent disposal of the Richmond Sunset Water Pollution Control Plant peak-wet-weather-flow capacity of 45 MGD and, during wet-weather, disposal of up to 100 MGD of decanted flow from the Westside Transport, a CSO control facility. Upon completion of the proposed Oceanside Water Pollution Control Plant and the remainder of the Westside CSO control facilities, the Ocean Outfall will carry a peak wet-weather flow of 160 MGD. This outfall has a design hydraulic capacity of 590 MGD (with pumping). The remaining hydraulic capacity is adequate for the disposal of all Bayside flows.

The 3200-foot diffuser for the Ocean Outfall begins 3.6 miles off of Fort Funston Beach. The diffuser is in 78 feet of water at an open ocean site with excellent dispersion characteristics. The diffuser was constructed with 85 multi-port risers, however, only 21 of the risers are in operation for handling Westside flows. If any Bayside flows are exported to SWOO, additional risers would be opened.

Under worst-case assumptions on flow, current speed and stratification, minimum initial dilution is estimated by at 58:1 (Tetra-Tech, 1986). Program staff modeled initial dilutions with EPA's UDKHDEN computer model at approximately 300:1 during typical dry-weather conditions. Dye studies in the fall of 1987 and late spring of 1988 yielded initial dilutions which were typically in the 150:1 to 350:1 range (CH2M-Hill, 1989). These dilutions are adequate to achieve all present California Ocean Plan water quality objectives.

ISLAIS CREEK DISCHARGES

QUANTITIES AND DURATIONS

Prior to the construction of any CSO control facilities, an annual average volume of CSO totaling approximately 1670 million gallons was discharged in Islais Creek. There was no discharge of treated effluent to the Creek until the Southeast Water Pollution Control Plant Expansion became fully operational in June 1983. From June 1983 to February 1989 between 4400 and 6800 million gallons per year (MG/Yr) of Southeast Water Pollution Control Plant effluent was discharged to the Creek. The majority of this discharge was during dry-weather conditions.

With the recent completion of the improvements to the Pier 80 outfall, no dry-weather discharges to the Creek will occur during normal operations. CSO discharges to the Creek currently average 890 MG/yr. Treated wet-weather effluent, currently a blend of approximately of 75% secondary effluent and 25% primary effluent, totaling 1700 MG/yr is now discharged through the Quint Street Outfall.

Upon completion of all Bayside CSO control facilities, the Southeast Water Pollution Control Plant will generate an average of 2520 MG/yr of effluent in excess of the capacity of the Pier 80 Outfall. If the amendment request is granted this excess effluent will be discharged to the Creek through the Quint Street outfall. If any of the other Alternatives are implemented there would be no discharge of treated effluent to the Creek under normal operations.

Upon completion of all Bayside CSO control facilities, CSO discharges to the Creek will average 460 MG/yr.

Table 1 provides estimates of the number of events, flow quantities and flow durations for both a typical rainfall year and a 96-percentile month (once-in-five-year rainfall month - 7.9 inches of rainfall).

TABLE 1

ISLAIS CREEK DISCHARGES

	Average Annual	96%-ile Month
Number of Discharges	48 (1)	20 (2)
Average Duration of Discharge - Hours	13.6	11.2
Total Duration of Discharges - Hours	653	225
Average Discharge Volume - Mill. Gall.	53.2	47.6
Total Discharge Volume - Mill. Gall.	2550	952

(1) Based on 6-hour separation between events
(2) Based on 1-hour separation between events

MASS EMISSIONS (TSS, BOD, AND SETTLEABLE SOLIDS)

Average annual emissions of TSS, BOD_5 and settleable solids discharged to Islais Creek for pre-program conditions (before 1983), current conditions (1989) and post-program conditions, with and without use of the Quint Street Outfall, are tabulated in Table 2.

The BOD_5 mass emission data in Table 2 suggests that there would be little improvement in the seabed conditions of the Creek if the Quint Street Outfall remained in operation. However, it is the settling characteristics of the emissions that is important in evaluating potential deposition near the discharge point.

File: J:\ISMASS

MASS EMISSIONS DISCHARGED TO ISLAIS CREEK

TSS, BOD AND SETTLEABLE SOLIDS

	FLOWS(MG/Yr)			CONCENTRATIONS (mg/l)					
				TSS (mg/l)		BOD (mg/l)		SETTLEABLE SOLIDS (ml/l/30 min.)	
CONDITION	CSO	EFFLUENT	TOTAL	CSO	EFFL-UENT	CSO	EFFL-UENT	CSO	EFFL-UENT
PRE-PROGRAM	1670	NA	1670	220	NA	36	NA	5.5	NA
APRIL 1989	890	1700	2590	220	50	36	40	5.5	0.1
POST- PROGRAM WITH INTERIM	480	2520	3000	220	30	36	16	5.5	0.05
POST-PROGRAM WITHOUT INTERIM	480	NA	480	220	30	36	16	5.5	NA

MASS EMISSIONS

	TSS (Tons/Year)			BOD (Tons/Year)			SETTLEABLE SOLIDS (m^3/Year) CASE 1 0% Removal in ICOC			CASE 2 50% Removal in ICOC		
CONDITION	CSO	EFFL-UENT	TOTAL	CSO	EFFL-UENT	TOTAL	CSO	EFFL-UENT	TOTAL	CSO	EFFL-UENT	TOTAL
PRE-PROGRAM	1532	NA	1532	251	NA	251	34765	NA	34765	34765	NA	34765
APRIL 1989	816	354	1171	134	284	417	18528	643	19171	18528	643	19171
POST- PROGRAM WITH INTERIM	440	315	755	72	168	240	9992	477	10469	4996	477	5473
POST-PROGRAM WITHOUT INTERIM	440	NA	440	72	NA	72	9992	NA	9992	4996	NA	4996

Notes:
NA = Not Applicable

April 1989 Effluent Concentrations Assume
75% Secondary & 25% Primary Blend

TABLE 2

TSS BOD mass emissions based on 0% removal in CSO control facilities (ICOC)

TABLE 3

SEABED DEPOSITION OF ORGANIC SOLIDS

EPA 301(h) TECHNICAL SUPPORT DOCUMENT

METHODOLOGY (1)

ANNUAL FLUX RATES
(kilograms per square meter per year)

DISTANCE FROM HEAD END OF CREEK
(meters)

	50			150			500 (2)			1500 (3)		
CONDITION	CSO	EFFL.	TOTAL	CSO	EFFL.	TOTAL	CSO	EFFL.	TOTAL	CSO	EFFL.	TOTAL
PRE - PROGRAM	14.5	--	14.5	5.2	--	5.2	1.5	--	1.5	0.4	--	0.4
MID - 1989	7.7	0.5	8.2	2.8	0.5	3.3	0.8	0.5	1.3	0.2	0.1	0.3
POST PROGRAM WITH QUINT ST.	2.0	0.4	2.3	1.0	0.4	1.4	0.3	0.4	0.7	0.1	0.1	0.2
POST PROGRAM W/O QUINT ST.	2.0	--	2.0	1.0	--	1.0	0.3	--	0.3	0.1	--	0.1

NOTES:

(1) Tetra Tech. Revised Section 301(h) Technical Support Document. US EPA May 1982

(2) At the Third Street Bridge

(3) Mouth of Creek

(4) Some totals may not add due to rounding

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SEABED DEPOSITION OF ORGANIC SOLIDS

The annual deposition rates (fluxes) of organic solids are predicted using the procedure described in Section VI of EPA's *Revised Section 301(h) Technical Support Document* (Tetra tech 1982). Annual fluxes are calculated at five points along the centerline of the Creek, for the four discharge cases described in the preceding paragraph. The results are tabulated on Table 3.

With the use of the Quint Street Outfall for effluent disposal, future (post-program) deposition of organic solids would be approximately one-forth of historic (pre-program) deposition at the head end of the Creek and approximately one-half of historic deposition in the vicinity of the Quint Street outfall.

DILUTION AND DISPERSION

In the absence of a simultaneous combined sewer overflow, the effluent discharge from the Quint Street Outfall will flow both easterly and westerly during all tidal phases. Upon reaching the head of the creek, the westerly flowing portion of the waste field (approximately 15% of the total), will rebound forming a sub-surface return flow. The total waste field thickness (initial waste field plus return flow) is approximately one meter.

During overflow conditions the entire waste field will flow downstream (easterly) towards the Bay.

The waste field will entrain underlying saline waters as it travels from the outfall to the mouth of the Creek. This entrainment will drag the upper portion of the underlying saline waters downstream resulting in a more energetic circulation than under conditions of no effluent discharge.

The exchange of water across the pycnocline is non-isotropic, that is, saline water will move upward across the pycnocline, but significant downward movement of surface water will not occur within the time frame the waste field is resident within the Creek.

However, because of the strong stratification and weak current shear, vertical mixing and consequent dilution of the surface waste field is minimal. Dilutions west of the Third Street Bridge and immediately east of the Bridge ranged from 0.2:1 to 1.5:1 (parts seawater to parts effluent). Dilution increases towards the mouth with an expected dilution of between 4:1 and 6:1 at the mouth.

Upon exiting the Creek, the surface layer will dilute rapidly by lateral spreading, with 25:1 dilution being achieved within 200 meters of the mouth (CH_2 M-Hill, 1979).

Flushing of the waste field from the Creek is fairly rapid. Within two days the surface layer salinity will return to pre-discharge conditions. Flushing times appear nearly independent of location along the Creek. Within the range of discharge rates and durations modeled, flushing time does not appear significantly affected by the discharge mass.

Appendix D contains a complete discussion of the hydrodynamics of the Creek including current characteristics, vertical mixing, and flushing times.

COMPLIANCE WITH WATER QUALITY OBJECTIVES AND EFFLUENT LIMITATIONS

Any discharge through the Quint Street Outfall will have to fully comply with the RWQCB,s effluent limitations and water quality objectives or obtain alternate effluent limitations and water quality objectives. Based on the special effluent sampling and receiving water monitoring done to date at the Quint Street Outfall, the Program has evaluated wet-weather compliance with the RWQCB's effluent limitations and water quality objectives for the Quint Street Outfall.

EFFLUENT LIMITATIONS

Conventional Pollutants

The following conventional pollutants are regulated in the Southeast Water Pollution Control Plant NPDES Permit:

Total Suspended Solids (TSS)	pH
BOD_5	Coliforms
Oil & Grease	Chlorine Residual
Settleable Solids	

During dry-weather conditions, the Southeast WPCP effluent has a good record of compliance with the effluent limitations established for the Pier 80 discharge. With one exception, compliance during wet-weather operations of the secondary process should be no more difficult than during dry-weather, the exception is pH.

Frequent non-compliance with the pH limitation for ~~an~~ Quint Street Outfall discharge may occur because: (1) urban runoff accounts for approximately 80% of the influent to the Southeast Water Pollution Control Plant during wet-weather. Uncontaminated rainfall can have highly variable pH, often dropping below 6.0 pH units; (2) the high-purity oxygen process used at the Southeast WPCP can cause a lowering of pH through the process of approximately 0.5 pH units, and (3) the pH limitation for the Pier 80 outfall is the RWQCB deep water limitation of 6.0 to 9.0 pH units at all times, whereas the pH limitation on the Quint Street Outfall is the shallow water limitation of 6.5 to 8.5 pH units at all times.

An effluent limitation of 6.0 to 9.0 pH units at all times should be achievable.

Effluent Limitations Toxicants

The Basin Plan Table IV-1 toxicant limitations applicable to the Quint Street Outfall are:

	Daily Average µg/l
Arsenic	20
Cadmium	10
Chromium (VI)	11
Copper	20
Cyanide	25
Lead	5.6
Mercury	1
Nickel	7.1
Silver	2.3
Zinc	58
Phenols	500
PAHs	15

Based on the Bureau of Water Pollution Control special effluent monitoring data collected this winter (see Table 4), potential areas of non-compliance with these limitations and achievable alternate effluent limitations are:

Cadmium

One of the four cadmium values was 11 µg/l which is 110% of the Basin Plan limitation of 10 µg/l. An effluent limitation of 15 µg/l should be achievable at all times.

Copper

Three of the four copper values were significantly over the Basin Plan shallow water limitation of 20 µg/l. The deep-water limitation of 200 µg/l should be achievable at all times.

Lead

The detection limit of the analytical method used by the Southeast Water Pollution Control Plant laboratory is 6.6 µg/l, which is higher than the Basin Plan effluent limitation of 5.6 µg/l. Although the effluent data suggests that compliance or near compliance will occur, historical data on CSOs and the primary effluent data suggest an alternate effluent limitation for lead of 30 µg/l will be required to insure total compliance.

TABLE 4

SOUTHEAST WPCP

EFFLUENT QUALITY

WET - WEATHER OPERATIONS

PRIMARY EFFLUENT — DATES

PARAMETER		11/14	11/22	11/23	12/19	12/20	12/21	AVERAGE
TSS	mg/l	161	101	77	93	142	127	116.8
BOD	mg/l	159	99	79	130	94	84	107.5
AMMONIA-N	mg/l	19.7	13.1	8.9	20.4	11.2	10.3	13.9
PHENOLS	ug/l	2730	160	NA	190	110	60	650.0
CYANIDE	ug/l	<20	<20	<20	20	20	<20	<20
PAH's	ug/l	NA	40	NA	NA	2.8	16	19.6
pH	units	6.9	7.3	7.3	7.2	7.0	7.0	7.1
ARSENIC	ug/l	NA	<1.9	<1.9	<1.9	NA	<1.9	<1.9
CADMIUM	ug/l	NA	<2.4	4	5	NA	6	3.8
CHROMIUM	ug/l	NA	12.7	<4.2	<4.2	NA	8.7	6.4
COPPER	ug/l	NA	45	56	55	NA	89	61.3
LEAD	ug/l	NA	12.1	13.4	8.3	NA	21.6	13.9
MERCURY	ug/l		Not Available - Equipment malfunction					
NICKEL	ug/l	NA	11	7.8	<2.2	NA	9.7	9.5
SILVER	ug/l	NA	6.7	<3.1	10.4	NA	<3.1	5.1
ZINC	ug/l	NA	210	160	156	NA	238	191.0

SECONDARY EFFLUENT

		11/14	11/22	11/23	12/19	12/20	12/21	AVERAGE
TSS	mg/l	NA	30	21	29	44	22	29.2
BOD	mg/l	NA	20	20	12	18	10	16.0
AMMONIA-N	mg/l	NA	13.2	8	15.2	15.1	11.8	12.7
PHENOLS	mg/l	NA	<50	NA	<50	60	<50	<50
CYANIDE	mg/l	<20	<20	<20	<20	<20	<20	<20
PAH's	ug/l	NA	<1	NA	NA	ND	<1	<1
pH	units	NA	7.0	6.9	7.6	7.0	7.1	7.1
ARSENIC	ug/l	NA	<1.9	<1.9	<1.9	NA	<1.9	<1.9
CADMIUM	ug/l	NA	5	11	7	NA	4	6.8
CHROMIUM	ug/l	NA	<4.2	<4.2	<4.2	NA	<4.2	<4.2
COPPER	ug/l	NA	47	29	216	NA	4	74.0
LEAD	ug/l	NA	<6.6	<6.6	<6.6	NA	<6.6	<6.6
MERCURY	ug/l		Not Available - Equipment malfunction					
NICKEL	ug/l	NA	3.1	4.6	<2.2	NA	5.1	3.5
SILVER	ug/l	NA	<3.1	<3.1	<3.1	NA	15.9	6.0
ZINC	ug/l	NA	143	103	112	NA	126	121.0

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Mercury

Mercury data was not obtained due to a malfunction of the analytical equipment. Historical dry-weather data and recent data on decanted Bayside CSOs (BWPC 1988) suggests that compliance with the Basin plan effluent limitation of 1 µg/l for mercury should be achievable.

Silver

One silver value in the secondary effluent was 15.9 µg/l which is significantly over the Basin plan shallow-water limitation of 2.3 µg/l. This may be an aberration as the silver concentration in the primary effluent for the same event was at the method detection limit of 3.1 µg/l. The other three silver measurements on the secondary effluent were at or below the method detection limit. The Basin Plan deep-water effluent limitation of 23 µg/l should be achievable at all times.

Zinc

All four zinc values were above the 58 µg/l effluent limitation. An effluent limitation of 200 µg/l should be achievable at all times.

Alternative Effluent Limitations

The Program requests the following modifications to the Table IV-1 shallow water, daily-average effluent limitations:

Toxicant	Shallow Water Limitation	Requested Alternate Limitation
Cadmium	10	12
Copper	20	150
Lead	5.6	13
Nickel	7.1	8.1
Silver	2.3	15
Zinc	58	150

The above Alternate Limitations are based on the 95%-ile levels measured in the wet-weather secondary effluent over a limited number of storms during the 1988-1989 wet-weather season. The Program will be gathering additional data on wet-weather effluent characteristics during the early part of the 1989-1990 wet-weather season in order to develop better estimates of the 95%-ile levels.

The requested alternate effluent limitations for cadmium, lead, nickel and zinc will still allow the discharge to achieve the water quality objectives of Table III-2A of the Basin Plan. There is no

Basin Plan objective for copper (EPA has rescinded its national ambient salt water criterion for this metal).

WATER QUALITY OBJECTIVES

pH

The Basin Plan objectives for pH are 6.5 to 8.5 pH units at all times and no more than 0.5 pH unit variance from ambient pH. pH at depths on all dates were between 7.23 and 7.67 which is ambient. pH at the surface (uppermost 2 meters) ranged from a low of 6.08 to ambient. The maximum apparent depression in surface layer pH was 1.39 pH units.

Based on a statistical analysis of the receiving-water pH data, the following 95%-ile levels should be achievable:

	West of 3rd Bridge	East of 3rd Bridge
Allowable Range	6.0 to 8.5	6.4 to 8.5
Maximum Departure from Ambient	1.5	1.1

Dissolved Oxygen

The applicable Basin Plan objectives for dissolved oxygen are a minimum of 5.0 mg/l at all times and a 3-month median of 80% of saturation. The Bureau of Water Pollution Control's data (Appendix E) for dry-weather discharges generally show a 0.5 mg/l to 1.5 mg/l depression westerly of the bridge in the surface layer. The lowest dry-weather dissolved oxygen level recorded during these studies was 5.4 mg/l (surface layer) which is within the objective.

During the four surveys the Bureau conducted during overflows, three surface layer measurements between 4.0 mg/l and 5.0 mg/l were recorded at stations west of the Third Street Bridge. During their 1979 survey, CH2M-HILL found a similar dissolved oxygen depression in the surface layer west of the Third Street Bridge on one survey. (The Quint Street Outfall was not in use at that time).

Based on a statistical analysis of the receiving-water dissolved oxygen data, 95%-ile (normal distribution) levels of dissolved oxygen of 4.8 mg/l west of the Bridge and 5.0 mg/l east of the Bridge will be achievable (this objective may not always be achieved west of the Bridge if CSOs are also occurring during the discharge period).

Since wet-weather discharges will be highly intermittent, even during very wet winters, compliance with the 3-month median objective of 80% of saturation should be achieved throughout the water column.

Temperature

The RWQCB' temperature objectives are referenced to the State Water Resources Control Board's "Thermal Plan" (SRWCB-1972). The applicable numerical objective for the Quint Street Outfall discharge is that the discharge temperature shall not exceed the natural receiving water temperature by more than $20^{\circ}F$ ($11.1^{\circ}C$). The lowest ambient temperature measured during the Bureau's field surveys was $11.7^{\circ}C$ ($53^{\circ}F$) which would yield an effluent limitation of $22.8^{\circ}C$ ($73^{\circ}F$). It is extremely unlikely that the temperature of a wet-weather effluent would exceed this temperature.

There are no numerical receiving water temperature objectives in the Basin Plan proper. The Thermal Plan (which is part of the Basin Plan by reference) contains a maximum temperature rise objective of $4^{\circ}F$ at any time for estuaries. This numerical objective, however, does not appear to apply to San Francisco Bay seaward of the Carquinez Bridge.

Un-disassociated Ammonia (NH_3)

54 of the 70 NH_3 values (77%) measured by the Bureau were below the Annual Median Objective of 0.025 mg/l. Even if the discharge were continuous, the annual median objective would be achieved.

Two NH_3 values slightly exceed the 0.16 mg/l maximum objective (0.171 mg/l and 0.200 mg/l). Both high values were within the effluent field during a dry-weather conditions with relatively high (7.7) ambient pH levels. These two high pH levels are believed to be an artifact of the sampling procedure (see Appendix E, Previous Studies) and are not representative of the pH in the effluent field. Actual surface pH levels were probably 0.5 to 1.0 pH units lower than reported, which would have yielded un-disassociated ammonia levels that would have been within the applicable Basin Plan objectives.

Notwithstanding the possibility that the two high NH_3 values are an artifact of sampling, occasional real or apparent violations of the NH_3 objective may occur in the future. Since the Basin Plan maximum objective of 0.16 mg/l is based on "...the protection of the migratory corridor running through Central Bay.."(1986 Basin Plan)" and Islais Creek is well removed from the corridor, the Program requests the South Bay maximum objective of 0.4 mg/l for NH_3.

Basin Plan Table III 2-a Objectives

The RWQCB has receiving water objectives for 10 toxicants other than ammonia. The water quality objectives for the other toxicants are identical to the effluent limitations for the Quint Street Outfall discharge. Therefore, achievement of water quality objectives for other toxicants are discussed in the preceding section on Effluent Limitations.

PROTECTION OF BENEFICIAL USES

In its Basin Plan, the RWQCB designated the following beneficial uses for the Central San Francisco Bay:

- Industrial Service Supply (IND)
- Industrial Process Supply (PROC)
- Navigation (NAV)
- Water Contact Recreation (REC-1)
- Non-Water Contact Recreation (REC-2)
- Ocean Commercial and Sports Fishing (COMM)
- Wildlife Habitat (WILD)
- Preservation of Rare and Endangered Species (RARE)
- Fish Migration (MIGR)
- Fish Spawning (SPWN)
- Shellfish Harvesting (SHELL)
- Esturine Habitat (EST)

This section provides a description of the actual beneficial uses of Islais Creek along with a discussion of the probable impacts on those uses resulting from the use of the Quint Street Outfall for wet-weather effluent disposal.

INDUSTRIAL SERVICE SUPPLY AND INDUSTRIAL PROCESS SUPPLY (IND and PROC)

There is no known existing or proposed industrial use of Islais Creek waters.

NAVIGATION

Since the closure of the coconut oil processing plant in 1985, the only portion of the Creek that is used for navigation is the section adjacent to Pier 80. The discharge of a secondary effluent should have no discernable impact on navigation.

WATER CONTACT AND NON-WATER CONTACT RECREATIONAL USES (REC-1 and REC- 2)

The Program retained Uribe and Associates to characterize recreational uses of the Creek, describe existing land use of the shoreline, and research pending changes in land use which could potentially result in increased recreational uses of the Creek. The following paragraphs are quoted from the Executive Summary for their report and the complete study report is included in this report as Appendix C.

"The purpose of beneficial use monitoring was to determine what human activities occur along the shoreline of the Creek and in and on its waters during the wet-weather season. Monitoring was conducted during twelve four-hour visits during December 1988 and January 1989. Each activity observed was classified as falling within one of the four beneficial uses identified for the Creek: Navigation, Commercial, Water-Contact Recreation, and Non-Water Contact Recreation. An "Other" category was created for activities not fitting into any of these categories. The number of people participating in each activity, the location, and the time of day, day of week, temperature, weather and tide level were also recorded.

The average number of people observed using the Creek during one monitoring visit was 19.5, with a high of 33 and a low of 8. Navigation and Commercial users were most common, accounting for 50% of the total use. The locations with the most activity were Pier 80, the northeast mini-park, and Pier 84. The breakdown among use categories on any given day did not show any clear pattern. The number of users observed on weekends and weekdays was fairly similar, and no trends of increasing or decreasing use over the two-month study period were seen.

The study area for the existing land use study is bounded by Army Street as extended to the Bay, Highway 280, and Evans Avenue as extended to India Basin. This 1.5 square mile area is largely industrial, with numerous empty lots, streets covered by railroad tracks, large warehouses, light industry, and auto wreckers lots. Although a parcel-by-parcel analysis was not performed for this study, comparisons with a San Francisco Department of City Planning study performed in 1986 showed no major changes in the types of businesses now in the neighborhood.

In [the] future, the neighborhood is expected to remain relatively stable. Much of the area is considered Port Priority Area, ensuring the continued use of the Islais Creek shorelines for maritime use. Some conversion of old warehouses into new businesses is starting to occur. Increased development of the North and South Container Terminals by the Port of San Francisco can reasonably be expected to occur. No other major projects are currently pending in the study area."

The wet-weather effluent discharged through the Quint Street Outfall will be disinfected with sodium hypochlorite (and dechlorinated). Such an effluent should have no adverse impacts on either water contact or non-water contact recreational uses.

OCEAN [MARINE] COMMERCIAL AND SPORTS FISHING

In recent years, commercial herring fishermen have gill-netted Pacific herring within Islais Creek, however no data is available on the magnitude of the catch within the Creek. During their twelve 4-hour recreational use counts Uribe and Associates counted a total of 23 individuals sport fishing and three individuals crabbing in Islais Creek (Appendix C Table 2.45-C).

Use of the Quint Street Outfall for discharging secondary effluent during wet-weather is not expected to have a measurable adverse impact on the commercial or sports fisheries found in Islais Creek for the following reasons:

> The effluent field will be a low salinity, surface field. The fish species in the Creek are all oceanic species that will avoid the thin surface layer of low salinity.
>
> The Southeast secondary effluent is of low toxicity (EA Associates, 1989). The Speckled sanddab, *Citharichthys stigmaeus* is the most sensitive species with a No Observable Effects Level (NOEL) tolerance of 10% effluent. This species (which is found in Islais Creek) is a demersal (bottom dwelling) species, consequently it is unlikely that this species would ever be exposed to the effluent at concentrations approaching its NOEL tolerance level.

WILDLIFE HABITAT

This beneficial use designation refers to riparian and wetland waterfowl habitat. Since the bulk of the shoreline of Islais Creek is developed for maritime uses, there are no areas of consequence that could be considered riparian or wetland habitat in the Creek.

PRESERVATION OF RARE AND ENDANGERED SPECIES

There are no known rare or endangered species in Islais Creek. All fish species found in the Creek are species that are commonly found in northeast Pacific Ocean waters from Baja California to the Gulf of Alaska (Hart 1973).

FISH MIGRATION

This dead-end backwater is well removed from any of the migratory routes through Central Bay, therefore, effects on migrating species are unlikely.

FISH SPAWNING

Over the past five years 70% of Pacific herring spawning in the Bay has occurred along the San Francisco waterfront (Bay Bridge to Sierra Point). Islais Creek and the area immediately offshore of the mouth of Islais Creek may account for 1% to 2% of the total Herring spawning. Herring spawning typically occurs between late October through March. Herring will use the pier pilings and rock substrates to spawn. (Montgomery Engineers 1988).

Ecological Analysts' (EA) 1980 impingement studies at the P.G.& E. Potrero Hill power plant located 0.4 mile north of the mouth of Islais Creek, indicates that the Northern anchovy and gobbies also spawn along the southeastern San Francisco waterfront (EA, 1980). However, it is not known whether these species actually spawn within Islais Creek.

The fact that Pacific Herring now successfully spawn within Islais Creek during wet-weather conditions indicates that this species does not find present conditions in the Creek inhospitable for spawning. Even with a Quint Street discharge of wet-weather effluent, future loadings of pollutants to Islais Creek during spawning season will be reduced from present conditions. In addition, use of the Quint Street Outfall for wet-weather effluent disposal will provide an expeditious means for the Program to achieve CSO control throughout the San Francisco portion of the spawning grounds, thereby achieving improvements to the overall conditions of the herring spawning grounds.

SHELLFISH HARVESTING

There are only scattered populations of bay mussels (*Mytilus edulis*) in Islais Creek. There is one small clam bed along the north bank of the Creek immediately east of the Third Street Bridge. (Sutton, 1978). In 1978 this 210 m^2 bed contained an estimated 1200 legal size (>38mm shell length) Japanese littleneck clams (*Tapes japonica*, now known as *Tapes philippinarum*) and 14,400 juveniles of three species (*Tapes japonica, Macoma natusa* and *Macoma inguinata*). This area is the only area within the Creek with appropriate substrate conditions for the Japanese littleneck clam. The littleneck clam appears to be the only species utilized for either food or bait. Sutton observed signs that fishermen occasionally take these clams for use as bait.

In January 1987, the State Mussel Watch (SMW) Program retrieved samples of transplanted California mussels which had been deployed in the Creek over the previous 4 months at a site approximately 600 feet east of the 3rd Street Bridge. Tissue analytes included 7 metals, 21 pesticides (not including isomers and metabolites) and 2 PCB's (Phillips 1988).The SMW data for their Islais Creek transplants is contained in Appendix E.

The Food and Drug Administration (FDA) has set Action levels (or Tolerance Levels) for eleven trace organics and one metal (methyl mercury) in shellfish tissue. The National Academy of Sciences recommends lower levels for two of the organics (DDT and PCB), and the California Department of Health Services (DHS) has published advisories for mercury at a lower level than the FDA Action Level.

The State Mussel Watch Program also compares their data against Median International Standards (MIS) which they calculate from a 1983 United Nations compilation of international standards for seafood quality. The MIS values are indicative of possible health effects, however, they have no legal significance in California.

There were no analytes above FDA, DHS, NAS or MIS human health criteria.

Present day discharges to Islais Creek do not appear to adversely impact shellfish populations. Even with use of the Quint Street Outfall for effluent disposal, future discharges of contaminants to the Creek will be reduced. Therefore, no adverse impact on shellfish populations is expected as a consequence of using the Quint Street Outfall for wet-weather effluent disposal.

The CSOs into Islais Creek will cause bacteriological contamination of the shellfish. However, the Quint Street Outfall discharge will be chlorinated and de-chlorinated, consequently this discharge should not adversely affect the bacteriological quality of the shellfish.

ESTURINE HABITAT

The discharge field from the Quint Street Outfall will be confined to the uppermost 1½ meter of the water column. The field will be intermittent and flushed from the Creek typically within two days after cessation of discharge. With the exceptions of pH, ammonia and silver, all Basin Plan Table III -2a water quality objectives will be achieved. Instances of non-attainment of the water quality objectives will be infrequent and generally of minor excursion outside of the range of the objectives.

Effluent toxicity data is not available for wet-weather effluents. The recently completed effluent characterization study suggests that the Southeast Water Pollution Control Plant dry-weather effluent is of low toxicity. The speckled sanddab *Citharichthys stigmaeus* was the most sensitive species tested with a No Observable Effects Level (NOEL) sensitivity of 10% effluent. The wet-weather effluent is not expected to be more toxic than the dry-weather effluent, if anything, it may be less toxic than dry weather effluent because of the lower ammonia levels.

Most resident species in the Creek are demersal (bottom dwelling) species which will be well below the effluent field and consequently unaffected by the discharge. Pelagic fish and most zooplankton can readily avoid the low salinity effluent field as the field will occupy only the uppermost 10% of the water column.

The settleable solids content of a secondary effluent is trivial (usually below detection limits), therefore, measurable impacts on the physical or chemical properties of the seabed of the Creek are unlikely. Reduction of CSOs to Islais Creek will result in a marked reduction in the discharge of settleable solids to the Creek, thereby improving conditions of the seabed of the Creek.

BAYSIDE III FACILITIES

The Bayside III facilities will consist of additional influent pumping and wet-weather treatment facilities to complete CSO control on the Bayside, along with any additional disposal facilities which may be needed to fully comply with the RWQCB's requirements for effluent disposal during wet-weather.

ISLAIS CREEK PUMP STATION (AND RELATED INTAKE AND DISCHARGE LINES)

The Islais Creek Facilities (see Background section) will provide the collection and storage facilities needed to capture wet-weather flows tributary to Islais Creek. A major influent pump in the Islais Creek area is needed to move the collected flows from Islais Creek Facilities to the Southeast Water Pollution Control Plant for treatment. With all alternatives involving either a new Bay Outfall or export to the Ocean Outfall additional effluent pumping capacity will be needed. The Program favors combining the influent pumping and effluent pumping (if needed) functions into a single pump station that would be situated on the property along the north side of Evans between Rankin Street and the I-280 freeway.

The pumping capacity for pumping influent to the Southeast Water Pollution Control Plant could range from 110 MGD to 220 MGD. Effluent pumping capacity (if needed) could range from 140 to 460 MGD.

If the RWQCB grants the amendment request, only the influent pumping section of the pump station would be needed initially. However, because of the complex piping network in and around the pump station, the Program would construct portions of the effluent pumping intake channels as part of the initial construction, thereby, facilitating a future addition of the effluent pumping functions.

BAYSIDE III TREATMENT FACILITIES

The Program must provide additional treatment capacity for the Southeast Zone in order to fully achieve the RWQCB's requirements for CSO control. The amount of additional treatment capacity could be a small as 40 MGD if the 32,500,000 gallon option for the Islais Creek Facilities is built and approximately 10 MGD of wet-weather flow in the south of Market area is redirected from the Channel Outfalls Consolidation to the Northshore CSO facilities. The economic trade-offs between treatment capacity and storage capacity are driven by the disposal location question. The disposal of the additional 40 MGD of wet-weather flow could be accomplished through existing outfalls if the RWQCB grants exceptions to their discharge prohibitions for the Quint Street Outfall. However if the amendment request is denied, the Program would have to provide additional disposal capacity.

The largest increase in treatment capacity under consideration is an additional 110 MGD capacity. The 110 MGD increase would bring the total

Bayside peak-wet-weather-flow capacity (including North Point Water Pollution Control Plant) to the 460 MGD recommended by the original Southwest Water Pollution Control Plant facility Planner (Metcalf & Eddy, 1980). This would most easily be accomplished by converting the Southeast Water Pollution Control Plant to a 'split-flow' mode during wet-weather. Split-flow involves operating the 180 MGD primary process facilities in parallel with the 140 MGD rated capacity of the secondary process facilities. The improvements needed at the Southeast Water Pollution Control Plant to implement split-flow include an additional 140 MGD of headworks capacity, interior modifications to the piping and an additional 140 MGD of disinfection capacity.

Switch over during wet-weather from normal series operation of the primary and secondary process units to parallel (split-flow) operation should not be quantitatively different from the normal difficulties of responding to the rapid changes of both influent volume and characteristics that normally occur during wet-weather (Malcolm Pirnie, 1980, and CH_2M-Hill 1980).

Split-flow is one of the two more promising treatment alternatives the Program is evaluating for the 250 MGD peak-wet-weather-flow alternative for wet-weather. The other promising alternative is piping and other interior modifications to allow an increase in the capacity of the primary process units to 250 MGD (Primary maximization).

Under either the 250 MGD split-flow alternative or the 250 MGD primary maximization alternative, additional disinfection capacity will be needed. In order to implement the proposal of discharging only secondary effluent to Islais Creek, the secondary effluent must be kept segregated from the primary effluent through the disinfection process. The cost estimates and schematics in this report are based on the assumption that a new chlorine contact channel with 110 MGD capacity will be needed to achieve the effluent segregation as it may be infeasible to partition the existing contact channels so that they could be used to provide segregated disinfection of primary and secondary effluents.

Under either of these alternatives, the capacity of the North Point Water Pollution Control Plant would be increased to approximately 155 MGD. The plant has a rated capacity of 140 MGD, however, on several occasions in the past, it has been operated at rates of 160 MGD to 180 MGD with no discernible degradation in effluent quality (CH2M-HILL 1981, BWPC 1989). Minor modifications at several hydraulic constrictions within the plant are proposed to improve operations at these higher rates.

The surface loading rate at 155 MGD would be approximately 2300 gallons per square foot per day (gal/ft^2/day). In 1981, the Program conducted a series of forcing tests at North Point Water Pollution Control Plant. Surface loadings rates up to 3600 gal/ft^2/day were evaluated. These tests showed that the North Point Water Pollution Control Plant could meet its NPDES Permit requirements at rates approaching 3000 gal/ft^2/day.

Only 140 MGD of North Point Water Pollution Control Plant capacity is needed for CSO control in the Northshore Area. Therefore additional capacity is available to use for CSO control in other zones if flows from those areas can be routed to the North Point Water Pollution Control Plant. By modifying the drop outs and diversion weirs in the south of Market area approximately 10 to 15 MGD of flow now flowing into the Channel Outfall Consolidation structure can be redirected to the North Point Water Pollution Control Plant. This would reduce the flow now pumped to the Southeast Water Pollution Control Plant during wet-weather, thereby providing additional capacity at the Southeast Water Pollution Control Plant for wet-weather flows originating in the Southeast sector of the City.

DISPOSAL ALTERNATIVES

In its 1988 Cease and Desist Order 88-105, the RWQCB set a deadline of May 1, 1990 to select an alternative to address their prohibition against wet-weather discharges with less than 10:1 initial dilution. The Program has three basic alternatives available to address this prohibition.

1. Construct a new offshore outfall with diffuser in San Francisco Bay at a cost of between $106,500,000 and $137,000,000.

2. Construct a Crosstown Transport to convey Southeast Water Pollution Control Plant effluent to the headworks of the existing Southwest Ocean Outfall at a cost of between $206,550,000 and $258,100,000.

3. Procure an exception to this discharge prohibition for the wet-weather flows in excess of the 110 MGD capacity of the Southeast Water Pollution Control Plant offshore outfall at Pier 80 which would cost approximately $61,520,000.

These costs are total project costs and include the influent pumping costs and increased treatment capacity costs for CSO control totaling $61,520,000 (described in the previous section).

Bay Disposal Alternatives

A new Bay outfall could be sized to carry the full Peak-wet-weather-flow capacity of the treatment facilities ultimately provided for the Southeast Zone or it could be sized on the premise of continuing to use the Pier 80 outfall for 110 MGD of the total peak-wet-weather-flow treatment capacity.

In 1988, the Program retained James M. Montgomery Associates to update and re-evaluate earlier planning proposals for a possible new Bay Outfall. Montgomery's evaluation was predicated on a 320 MGD peak-wet-weather-flow capacity from the Southeast zone wet-weather treatment facilities. They considered three disposal options in this evaluation.
(James M. Montgomery 1988)

320 MGD Peak-Wet-Weather-Flow Bay Disposal Option

Under this option, all dry-weather flow and 210 MGD of wet-weather flow would be discharged through a new 78 inch diameter outfall off of central basin. The 1600 foot long diffuser section would begin 6000 feet offshore (measured orthogonal to the shoreline) and would be in 58 feet of water. The diffuser would have two hundred 4½" diameter ports in four-port risers located on 32-foot centers. The remaining 110 MGD peak-wet-weather-flow from the Southeast Water Pollution Control Plant would by discharged through the existing Pier 80 Outfall.

210 MGD Peak-Wet-Weather-Flow Bay Disposal Option

During dry-weather, all Southeast Water Pollution Control Plant effluent would be exported to Ocean Outfall via a Crosstown Force Main. During wet-weather, disposal of Southeast Water Pollution Control Plant effluent would be at three sites. Flows up to 110 MGD would continue to be exported to the Ocean Outfall. 100 MGD of the 320 MGD peak-wet-weather-flow would be discharged through a 54 inch Bay outfall off of Central Basin. The 288-foot long diffuser section would begin approximately 3000 feet offshore and it would be in 38 feet of water. The diffuser would have thirty-six 8 inch diameter ports positioned on 2-port risers at 16-foot centers. This diffuser design would be essentially the same design as the present Pier 80 Outfall. The remaining 110 MGD peak-wet-weather-flow from the Southeast Water Pollution Control Plant would be discharged through the existing Pier 80 Outfall.

110 MGD Peak-Wet-Weather-Flow Bay Disposal Option

During dry weather, all Southeast Water Pollution Control Plant effluent would be exported to the Ocean Outfall via a Crosstown Tunnel. During wet-weather 210 MGD would be exported to the Ocean Outfall, the remaining 110 MGD would be discharged to the Bay through the existing Pier 80 Outfall.

Predicated initial dilutions (EPA's UMERGE Model) for the 210 MGD outfall would be about 35:1 under either worst-case dry-weather assumptions or worst-case wet-weather assumptions. Predicted initial dilutions under typical dry weather conditions at the 210 MGD outfall diffuser would exceed 500:1. Predicated worst-case wet-weather dilution for a new 100 MGD Bay outfall would be 20:1. These dilutions are adequate to achieve all present RWQCB receiving water objectives for toxicants.

An effluent pump station and approximately 1¼ miles of onshore piping would be needed to connect the Southeast Water Pollution Control Plant to the landfall of either new outfall.

Schematic layouts of the two new Bay outfall proposals are shown in Figure 4. Profiles, typical sections and engineering data are reproduced in Appendix B.

Ocean Disposal Alternatives

A comparable sizing decision exists for exporting Southeast Water Pollution Control Plant effluent to the Southwest Ocean Outfall through a Crosstown Transport. The Program could decide to export only the actual 110 MGD peak-dry-weather-flow (PDWF) of the Southeast Water Pollution Control Plant to the Ocean Outfall and utilize existing Bay outfall capacity to handle the balance of the peak-wet-weather-flow discharge from the southeast treatment facilities. This alternative would leave a 40 MGD to 110 MGD deficit in wet-weather disposal capacity depending on the peak wet-weather flow capacity of the Southeast Water Pollution Control Plant.A variant of this alternative would be to export 140 MGD to the Ocean. If the Southeast Water Pollution Control Plant was Sized at 250 MGD, this 140 MGD Ocean export plus the 110 MGd capacity at Pier 80 would provide the needed disposal capacity.

If 110 MGD or 140 MGD is exported to the Ocean Outfall, this would be most economically accomplished by construction of a near surface force main with an approximate inside diameter of 78 inches.

If the Program decides to also export a significant portion of wet-weather flow to the Ocean Outfall, construction of a deep tunnel could be preferable to construction of a large diameter surface force main. The long length of such a tunnel establishes a minimum practical inside diameter of 9 feet to provide for adequate working room during construction. A 9-foot diameter tunnel would have adequate hydraulic capacity to convey the full peak-wet-weather-flow capacity of the Southeast zone treatment facilities

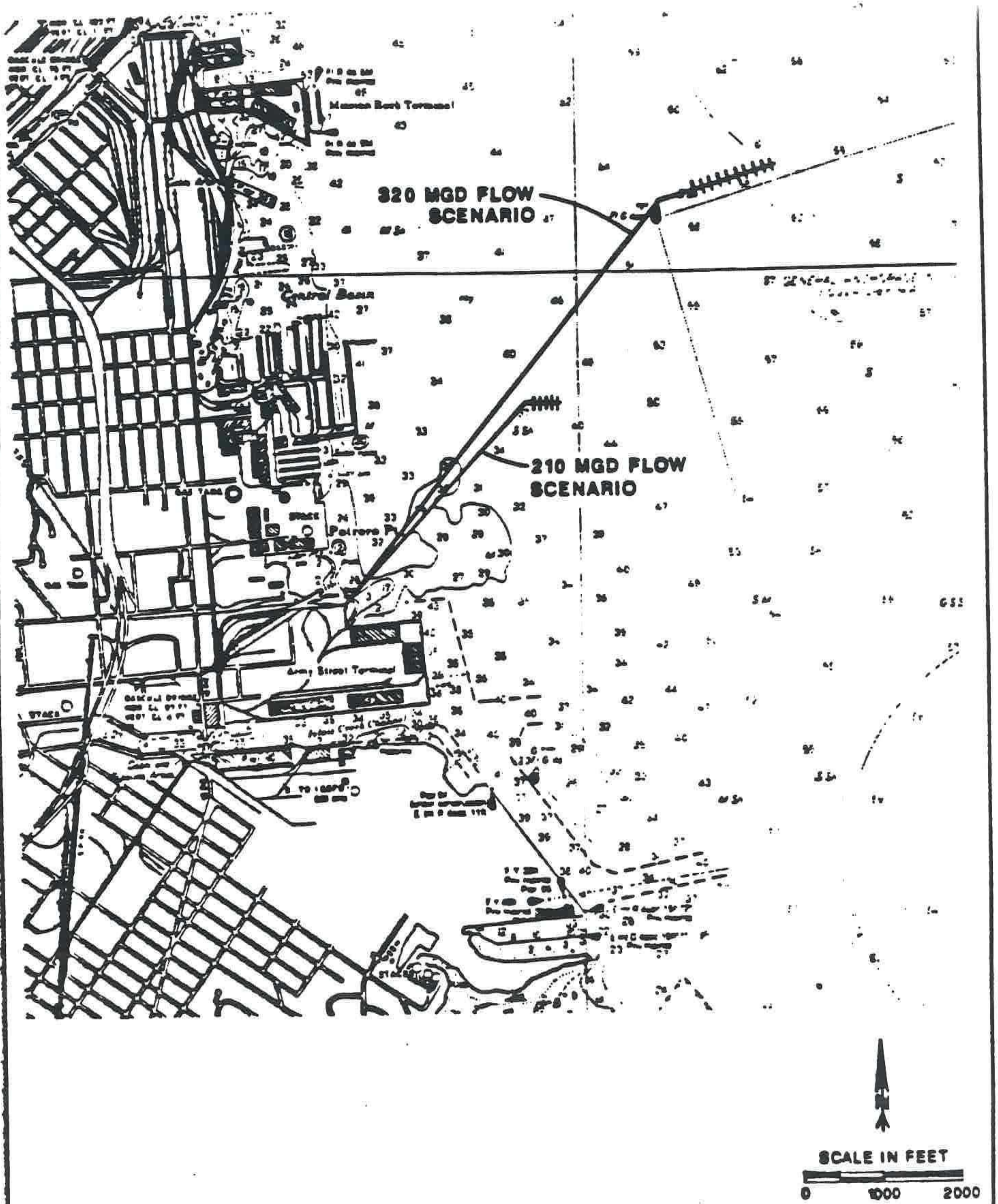

FIGURE 4

BAY OUTFALL ALTERNATIVES

to the Ocean Outfall. The Ocean Outfall has adequate remaining capacity to handle a total export of Bayside wet-weather flow. The Program, therefore, would use the Pier 80 outfall only during emergencies.

Evaluation of Discharge Alternatives

The Bayside III facilities plan will cover a host of treatment and discharge alternatives. The evaluation of discharge alternatives in this report is limited to comparing the most likely Bayside III facilities if an amendment is granted for wet-weather discharge through the Quint Street Outfall with the least expensive Bay disposal and least expensive Ocean disposal alternatives to achieve full compliance with the RWQCB's requirements. Comparable treatment rates and treatment process at the Southeast Water Pollution Control Plant are assumed for all three systems.

The three discharge alternatives considered in this report are based on a 250 MGD peak-wet-weather-flow split-flow process at Southeast Water Pollution Control Plant. At this point in the facilities planning process, split-flow and flow maximization appear equally attractive means for achieving the requisite capacity at the Southeast Water Pollution Control Plant. The costs for the two process conversions are comparable. Discharge location has no bearing on the treatment process selection for these three alternatives. Therefore, the costs comparisons between these three discharge alternatives would be valid if either process is selected.

The proposed Islais Creek Pump Station would be substantially different, however. For the Quint Street Outfall discharge alternative, the pump station would be a 170 MGD influent lift station. For the 140 MGD new Bay Outfall or 140 MGD Crosstown force main alternatives the pump station would be both a 170 MGD influent lift station and a 140 MGD effluent pump station. Additional piping would be needed to connect the pump station to the Southeast Water Pollution Control Plant if it also serves as an effluent pump station.

Appendix B contains schematics showing: System flow routing for the Islais Creek discharge alternative, System flow routing for a new 140 MGD Bay Outfall off of the Central Basin, System flow routing for the 140 MGD Crosstown force main alternative, Schematic of the split-flow process at Southeast Water Pollution Control Plant and Schematic of the flow maximization process at Southeast Water Pollution Control Plant.

Cost

Table 4 shows major line item costs for these three discharge alternatives. These costs are predicated on an ENR Index of 5517 (January to June 1987) which the Program has adopted as a common cost index for all Bayside III Planning Studies.

Assuming split-flow process at the Southeast Water Pollution Control Plant, the costs for the remaining work to fully achieve the RWQCB's CSO requirements would be $61,520,000 (total project life costs).

This costs comparisons show that the least expensive Bay disposal alternative to achieve all of the RWQCB's requirements during wet-weather would cost $30 million more in contract costs than the Islais Creek discharge alternative (assumes amendment request is approved). If all project costs including engineering, administration, contingencies land, and the present worth of the operations and maintenance (O&M) costs for a 30-year assumed project life, are considered, the cost differential would be $45 million.The least expensive ocean disposal alternative would cost $90,000,000 more in contract cost and $145,000,000 in project life costs than the Islais Creek disposal alternative.

BAYSIDE III FACILITIES

COST COMPARISON
DISCHARGE TO ISLAIS CREEK
VERSUS FULL COMPLIANCE

(Assumes Split-Flow @ Southeast WPCP)

	COST (in $Millions)		
Element	Quint Street Outfall	New 140 MGD Bay Outfall	140 MGD X-Town Force Main
Islais Creek Pump Station	15.91	23.31	38.35
Piping ICPS to SEWPCP	0.96	1.14	1.14
140 MGD Outfall Onshore	NA	4.54	NA
140 MGD Offshore Section	NA	18.25	NA
X - Town Force Main	NA	NA	65.74
Energy Recovery	NA	NA	2.24
Common Elements			
Capacity Mods. @ NPWPCP	0.32	0.32	0.32
Flow Redirection S/Market	0.11	0.11	0.11
Split Flow @ SEWPCP	12.06	12.06	12.06
Sub-total	29.36	59.73	119.85
Miscellaneous Costs			
Contingencies @ 10%	2.94	5.97	11.99
Professional Services @ 16%	4.70	9.56	19.13
Land @ Islais Creek PS	1.60	1.60	1.60
Present Worth of O&M	25.13	34.60	63.49
Salvage value (30 year)	(2.21)	(4.96)	(9.56)
Total	61.52	106.50	206.55

Costs are ENR 5517, Jan.-June 1987
Present day (2/90) Costs would be about 5% higher.

Table 4

MODIFICATIONS TO THE QUINT STREET OUTFALL

At the suggestion of RWQCB staff, the Program investigated the feasibility of modifying the Quint Street Outfall to lessen the adverse impacts of the Islais Creek discharges (effluent and CSO). Two alternatives that are considered are to:

1) Relocate the outfall to the head-end of Islais Creek in order to provide improved flushing of the large CSO field from the CSO structures at the head-end of the Creek.

2) Modify the exit geometry of the Quint Street Outfall to obtain better dilutions and consequent better compliance with the Basin Plan water quality objectives.

RELOCATION TO THE HEAD-END OF THE CREEK

Average annual hours of operation under present and future conditions of wet-weather discharges to Islais Creek are as follows:

	Present Conditions	Future Conditions
Quint Street Outfall	440	653
CSO Structures	102	36

Consequently, during virtually all storm events, the discharge of Southeast Water Pollution Control Plant effluent to the Creek will persist for several hours to several tens of hours after cessation of a combined sewer overflow. By relocating the Quint Street outfall to the head-end of the Creek, the Southeast Water Pollution Control Plant effluent would provide a high quality effluent to flush the CSO field from the Creek following cessation of an overflow. The 140 mgd effluent field will typically induce surface-layer current speeds of between 15 and 25 cm/sec. towards the mouth of the Creek, which theoretically would flush the remaining CSO field from the Creek in two to four hours compared to the twenty-four to forty-eight hour flushing time estimated by CH2M-Hill* (see Appendix E). The total time for the Creek to return to pre-discharge conditions (95% of ambient salinity) would remain unchanged, however.

A major disadvantage of this relocation would be that the effluent field would have an additional 450 meters to travel before reaching the mouth of the Creek, thereby increasing residence time in the Creek.

* The CH2M-Hill flushing time estimate is actually for the effluent field, CSO flushing time, however, would be comparable.

The longer residence time would lead to an increase in seabed deposition of flocculated effluent solids. The predictive uncertainties inherit in the available circulation models and seabed deposition models are of sufficient magnitude that it is not possible to estimate whether this relocation proposal would result in an increase or decrease in the combined impacts of the two discharges on the seabed conditions of the Creek. Any increase or decrease in total seabed deposition would be small, however.

Costs to relocate the effluent discharge from Quint Street to the head-end of the Creek are estimated at $5,200,000 in 1989 dollars. Because of the uncertain benefits, if any, of this proposal, the Program does not recommend the relocation of the effluent outfall to the head-end of the Creek.

OUTFALL EXTENSION WITH AND WITHOUT DIFFUSER

The other alternative to potentially minimize the impacts of the Quint Street discharge is a short extension of the outfall coupled with a lowering of the elevation of the outfall and possible provision of a short, multi-port diffuser section. The present Quint Street discharge essentially floats on the surface of Creek with only minimal initial dilution (0.4:1 to 1:1, parts seawater to parts effluent). By lowering the crown of the discharge from the present elevation of +1.2 feet MLLW to an elevation below -3 feet MLLW, the quantity of salt water available for dilution would be increased and dilutions of between 1.5:1 and 3:1 should be achievable without a diffuser. Slightly better average dilutions would be obtainable by adding a short (30-foot to 60- foot) diffuser section consisting of 12 to 15 pairs of 24 inch to 36 inch diffuser ports. A long diffuser section (100 feet to 200 feet) does not appear feasible as; a) outfall head losses would increase to the point that effluent pumping would be required, which would be expensive; b) the diffuser would extend into the center of the channel, thereby, creating an obstacle to future maritime uses of the west end of the Creek and c) the maximum achievable initial dilution at this site appears to be limited to about 6:1 due to the minimal tidal circulation in the Creek, consequently, a long diffuser would provide little additional performance over a short diffuser.

Costs for a short outfall extension with or without diffuser ports would be between $800,000 and $1,200,000. As noted above, the advantage would be better dilution and closer achievement the Basin Plan receiving water objectives. The potential disadvantage of this proposal (aside from cost) are greater seabed deposition of sewage solids within the Creek as a consequence of both the greater flocculation that will occur as a result of the more rapid mixing and of a probable reduction in the eastward velocity of the effluent field.

Any relocation or modification to the Quint Street Outfall will require approvals or permits from the Port of San Francisco, the US Army Corps of Engineers and the Bay Conservation and Development Commission (BCDC). The costs given above for these two proposals considers only engineering aspects of the proposal. No investigation has been made of additional costs that could be incurred to satisfy terms of the requisite permits.

If continued use of the Quint Street Outfall is to be for a relatively short period of time (five to ten years), modifying the exit geometry to provide better dilutions does not appear worthwhile. However, if the Quint Street outfall were to remain in permanent operation, additional studies directed at minimizing its impacts would be worthwhile.

PRETREATMENT PROGRAM

FOR SMALL QUANTITY GENERATORS

Over the past decade and a half, the City's Industrial Waste Division has acquired considerable data on metal contributions from major industrial sources and industries subject to categorical pre-treatment requirements. Industrial sources have been controlled through implementation of EPA categorical standards, local Ordinance and Department of Public Work's Administrative Orders requiring industrial dischargers to minimize or eliminate discharges of metals where practical. Over this period the quantity of metals in the influent to the Southeast Water Pollution Control Plant has been reduced by approximately 80%.

Major industrial sources and categorical pretreatment industries are now controlled to the maximum extent practical. In order to achieve further reductions in influent metal levels, it will be necessary to identify and control small industrial sources.

Consequently, the City is currently undertaking a series of measures to further reduce the introduction of metals from small industrial sources into the sewer system on the east side of the City. Such efforts are designed to result in a measurable reduction in metals discharged in during dry-weather at the Pier 80 Outfall and during wet-weather at the Quint Street Outfall and the four operational combined sewer overflow structures in the Creek. The components of this effort are as follows:

AMEND INDUSTRIAL WASTE ORDINANCE TO INCLUDE METALS

The City's Industrial Waste Ordinance (pretreatment ordinance) applies to all non-residential dischargers regardless of size.
This ordinance currently contains limitations on COD, oil and grease and sulfides. However, with the exception of chromium, the present ordinance does not regulate metals (Calif. Title 22 requirements are enforced where necessary). The Program's Industrial Waste Division has drafted proposed amendments to the Ordinance to include the regulation of all metals now regulated in the NPDES permit for the Southeast Water Pollution Control Plant. On May 3, 1989, the Program submitted the proposed numerical standards for metals to the RWQCB and the EPA for their review and approval. Upon receipt of their concurrence, the Program will conduct the necessary public process to have the numerical limits adopted. Once adopted, the Program will prepare information brochures and hold workshops to inform the industrial community of the new standards.

MONITOR MAJOR INFLUENT STREAMS TO THE SOUTHEAST WPCP

There are four major influent streams into the treatment process at the Southeast Water Pollution Control Plant, the 66" force main from Channel Pump Station, the influent lift pumps serving the Islais Creek and Mariposa sub-basins, the influent lift pumps serving the Southeast Zone (Hunters Point, Yosemite and Sunnydale basins), and the plant recycle lines. Beginning in August 1989, the City,s Industrial Waste Division has been collecting simultaneous 24-hour composite samples on these streams and analyzing these for the eight metals currently regulated in the Basin Plan.

The purpose of this is two-fold:

1) To indicate the difference between dry-weather and wet-weather influent metal content, and

2) To identify particular drainage basins which may contribute unusually high amounts of any metal to the total influent stream.

SMALL QUANTITY GENERATOR INSPECTION AND FOLLOW-UP

In order to quantify inputs from small quantity generators, the Industrial Waste Division will conduct block-by-block screening inspections to locate small quantity generators. Where the business generates liquid wastes such as waste oil or solvents, where feasible, Industrial Waste will obtain grab samples to quantify inputs. Initially emphasis will be placed on motor vehicle repair related activities. The concentration data will be combined with water consumption data to produce estimates of mass emissions.

If the quantity of metals appears significant or exceeds ordinance requirements,the small quantity generator will be scheduled for detailed follow-up inspections and monitoring. Problem dischargers will be targeted for enforcement or waste minimalization efforts. The follow-up inspections will begin by the third quarter of 1990.

This effort has begun in the Islais Creek drainage area, and will eventually include the entire tributary area to the Southeast Water Pollution Control Plant. This effort will take an estimated five years to complete. The Program will provide a status report on this work in each Quarterly Pretreatment Report beginning in the first quarter of 1990.

Some small quantity dischargers may be using nearby street drainage inlets (catch basins) for disposal of liquid wastes. Industrial Waste Division will be collecting samples from catch basins in the suspect industrial areas in an effort to quantify the problem and identify the responsible parties. Several potential sites have been selected and monitoring will begin this year. The first data will be reported in the 1990 Pre-treatment

Annual Report. Subsequent data will be reported in the quarterly reports as it becomes available.

SMALL GENERATOR WASTE MINIMALIZATION PROGRAM

The City,s Solid Waste Program recently retained a consultant to:

Perform waste audits of a minimum of 100 small quantity generators

Develop low cost and other options for waste minimalization

Conduct a minimum of four workshops to acquaint small quantity generators with waste minimalization techniques

The Consultant is scheduled to begin work in early 1990. The Clean Water Program will be cooperating with the Solid Waste program on this study.

ACKNOWLEDGEMENTS

This report was prepared by the Planning and Control Division of the Clean Water Program under the direction of Michele Pla, Division Manager. Dave Jones was the principal author. Harold C. Coffee Jr. of Project Management and Norman Chan of the Engineering Division provided technical data on the proposed Islais Creek and Bayside III facilities. Lou Vagadori and Gene Handa of the Technical Services Division of the Bureau of Water Pollution Control provided cost and engineering data on the treatment alternatives under consideration. James Salerno, Laboratory Manager at the Southeast Water Pollution Control Plant supervised the effluent sampling and Islais Creek field monitoring work. Arleen Navarret of the Southeast Laboratory staff provided editorial assistance on the Previous Studies Appendix.

Uribe and Associates undertook the Beneficial Use Survey and provided support services. Ann Lasala was Project Manager for the Beneficial Use Survey. Fred Krieger and Ellen Rosenstein assisted in the report preparation.

Chris Phanartzis of Hydroconsult Engineers developed the projections of existing and future effluent and combined sewer overflow discharges to Islais Creek.

CH2M-Hill developed and field calibrated the circulation model of Islais Creek. David Wilson of their Emeryville office was their Project Manager. Dr.Steven Costa, Virender Bhugal and Mary Landsteiner of their Bellevue, Washington office developed the circulation model.

Dr. James L. Cronin of EVS Consultants assisted in the analysis and interpretation of the sediment chemistry data.

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APPENDIX A

PLAN OF STUDY

STATE OF CALIFORNIA GEORGE DEUKMEJIAN, Governor

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION
1111 JACKSON STREET, ROOM 6040
OAKLAND 94607

Phone: Area Code 415
464-1255

September 28, 1988
File No. 2169.6010(SAH)

RECEIVED
SAN FRANCISCO
CLEAN WATER PROG.
RECORDS CENTER
OCT 4 '88

Mr. Robert T. Cockburn, Executive Director
San Francisco Clean Water Program
P.O. Box 360
San Francisco, CA 94105

Dear Mr. Cockburn:

This letter responds to your August 25 letter, in which you propose a study plan for tasks that would lead up to an exception request for the Southeast sewage treatment plant. The city would be requesting an exception from the Basin Plan requirement of at least 10:1 initial dilution for wet-weather discharges from the Southeast plant. We have reviewed the draft study plan and conclude that it covers the main points. We have a few specific comments, which are given below. I have also taken the opportunity to review the city's wastewater improvements program as it relates to the narrower initial dilution issue.

San Francisco is nearing a major decision point in its wastewater improvement program. With most wastewater projects either built or in planning/design, the city must decide how to meet the Basin Plan's initial dilution requirements at its Southeast plant. The city's Master Plan calls for a cross-town transport, to take plant effluent to the ocean outfall. Other options include a new, bigger Bay outfall and a Basin Plan exception during wet-weather. San Francisco's decision will be affected by several factors: (1) the need for additional storage and/or treatment capacity in the Southeast area as the final wet-weather projects are finished, (2) the need to revise its Master Plan if the cross-town transport option is not chosen, and (3) increasing local costs of wastewater projects as the Clean Water Grants program winds down.

San Francisco will soon expand its Southeast effluent pump station. After March 1989, it will be able to discharge all dry-weather effluent to the deep water outfall at Pier 80. However, during wet-weather periods, effluent flows rates will increase to a maximum of 210 million gallons per day (mgd), far in excess of the 110 mgd capacity of the expanded effluent pump station. When this happens, the excess flow will be discharged to Islais Creek with less than 10:1 initial dilution. We expect these near-shore discharges to occur at least ten times each year.

At a staff level, we have encouraged the city to apply for a Basin Plan exception to the initial dilution requirement under provision "a" (inordinate burden placed on the discharger relative to beneficial uses protected, and an equivalent level of environmental protection can be achieved by alternate means). The Islais Creek effluent discharge would be intermittent and would represent a small percentage of the Southeast plant's annual flow. We understand that the city can make improvements to reduce the volume, frequency, and quality of Islais Creek effluent discharges during wet weather. For example, San Francisco can discharge only secondary effluent at the near-shore location, with the secondary-primary blend discharged only at the deep-water outfall.

The Regional Board's recent Cease and Desist Order 88-105 set a deadline of May 1990 for the city to select an alternative that will comply with the initial dilution requirement during wet weather. The city in turn has proposed a schedule for a Basin Plan exception request, with the city submitting the formal request in mid-1989 and the Regional Board acting on it later in 1989. Implicit in this schedule is the assumption that further planning for a cross-town transport or new Bay outfall would be suspended if the city received the exception. We would prefer to have all three options spelled out in detail before the Board acts on an exception request. However, we are willing to prepare a recommendation on the exception if we have sufficient information on the other two options (see below).

The draft study plan describes special monitoring and other tasks that San Francisco would conduct to support a Basin Plan exception request. In summary, the city would define alternatives for Bayside CSO storage and treatment, and alternatives for effluent disposal. One alternative will be increased treatment capacity at the North Point wet-weather plant. The city would document beneficial uses at Islais Creek as well as current water quality conditions (including water column, sediment, and benthic infauna). The city would characterize Southeast plant effluent quality during wet weather, including acute toxicity.

We concur with the overall direction and scope of the study plan. We offer several specific comments on the draft:

(1) Wet-weather effluent monitoring should include heavy metals, so that all Table 4-1 parameters are covered.

(2) Wet-weather effluent monitoring should contrast the quality of secondary effluent versus the blend of secondary-primary effluent actually discharged by the Southeast plant. This will allow us to estimate the water quality advantage of discharging only secondary effflugnt at Islais Creek.

(3) The study should define initial dilution at Islais Creek during wet-weather conditions, using a dye study or other method. We want to be able to define the area of impact when we consider the exception request.

(4) The exception request should clearly identify the preferred option for near-shore discharge and any alternatives still under consideration. For each option, the city should discuss: what improvements needed to implement the option, cost and schedule for improvements, relationship to city's Master Plan, quality of near-shore effluent discharge, and discharge quantity (frequency, duration, and total volume of near-shore effluent discharge). Projected reductions in discharge frequency or volume should be documented, so that we can assess them in light of the exception criteria ("alternate means of environmental protection").

(5) The exception request should clearly identify the cost of compliance with the initial dilution requirement (cross-town transport or new Bay

outfall). We need this information in order to decide whether compliance would represent an "inordinate burden" to the city.

(6) The city should decide if it will also request an exception from certain Basin Plan receiving water limitations for the near-shore effluent discharges (i.e. receiving water pH, dissolved oxygen, and un-ionized ammonia concentrations). If so, the exception request should document receiving water concentrations of these parameters and the relative importance of effluent discharges to Islais Creek.

(7) The city will shut down the Southeast effluent pump station for several days over the next three months, as it completes the expansion project. These shut-downs will provide an opportunity to monitor actual receiving water conditions during periods of substantial effluent discharge to Islais Creek. The city may wish to schedule special monitoring on shut-down days.

(8) The draft study plan cites some linkage between the unfinished CSO projects and the exception request (Background, first paragraph). The Regional Board's action on an exception request should not affect these CSO projects, and vice-versa. The draft should be revised to remove this linkage argument.

I appreciate the opportunity to review your study plan. Please send us a copy of the final study plan. Please contact Mr. Stephen Hill of my staff at (415) 464-0433 if you have any questions.

Sincerely,

Lawrence P. Kolb
for

Teng-chung Wu, Division Chief
Surface Water Protection Division

cc: Bill Robberson, EPA (W-2-2)
Jim Salerno, SF BWPC

FINAL PLAN OF STUDY

ISLAIS CREEK INTERIM OUTFALL

WET-WEATHER EXCEPTION 10:1 DILUTION

OCTOBER 20, 1988

INTRODUCTION

The purpose of the study is to evaluate whether an exception to the Basin Plan requirement for 10:1 initial dilution would be, warranted if the City discharged a portion of the wet-weather effluent from the SEWPCP into Islais Creek through the present shoreline, surface outfall. [*D.Jones*]

BACKGROUND

Describe status of implementing Bayside CSO control facilities. Provide appropriate graphics(s) to depict Bayside CSO facilities and tabulations, by sub-basin of average annual volumes of overflow for both pre-control and post-control conditions. [*D. Jones and Civil Design*]

Discuss regulatory requirements for Bayside CSO facilities. [*D. Jones*]

BAYSIDE III ALTERNATIVES

Discuss relationships between storage volumes, treatment rates at NPWPCP and SEWPCP, and annual number and volume of untreated CSO. [*C. Phanartzis & H. Coffee*]

Discuss alternatives for the capture of CSO being evaluated under the Bayside III planning. Include schematics and capacities of storage locations evaluated. [*C. Phanartzis & H. Coffee*]

Discuss alternatives for treating captured CSO. Alternatives to include:

Increased use of the NPWPCP. [*C. Phanartzis & H. Coffee*]

Increased capacity at SEWPCP (1) conventional operation and (2) split-flow, i.e. primary and secondary process trains operated in parallel during wet-weather. [*L. Vagadori etal*]

Baffling and disinfection of decanted flow from CSO retention facilities. [*C. Phanartzis & M. Coffee*]

Discuss alternatives for discharging treated effluents. Alternatives to include:

Export to Ocean by either tunnel or force main [*M. Coffee*]

New Bay outfall designed for either wet-and dry weather service or minimal wet-weather outfall to the open bay [*M. Coffee*]

Use of existing shoreline outfall in Islais Creek (Interim Outfall) [*M. Coffee & G. Nanda*]

For NPWPCP outfalls, provide initial dilution estimates (UDKHDEN) for flow ranges of 140-210 PWWF. [*D. Jones*]

All discussions for capturing, treating and discharging effluents (disposal) will include narrative descriptions, schematics, costs (initial and equivalent annual) and evaluations (advantages - disadvantages) for all alternatives considered.

BENEFICIAL USES

Characterize existing and proposed land uses along the entire shoreline of Islais Creek. [*Uribe Assoc.*]

Field survey and outside agency contacts to characterize existing beneficial uses of Islais Creek. Beneficial uses to be characterized include shipping, commercial and recreational fishing, water contact and non-water contact recreation. [*Uribe Assoc.*]

WET-WEATHER EFFLUENT CHARACTERISTICS

Collect flow-weighted composite samples of both primary and secondary effluents from 3-5 wet-weather events at SEWPCP and analyze for:

TSS
BOD_5
Basin Plan Table 4-1 metals (inc. Se)
Cyanide
Total Ammonia
Polynuclear Aromatic Hydrocarbons (PAH)

Composite samples to be obtain by using ISCO-type auto-samplers to collect samples of wet-weather effluents every 20 minutes whenever SEWPCP effluent flow exceeds 150 MGD or 1.5 times expected dry-weather flow due to rain. [*J. Salerno etal*]

Obtain pH readings on secondary effluent every 20 minutes (or continuously) during wet-weather sampling. [*J. Salerno etal*]

Based on measured wet-weather secondary effluent characteristics and estimated yearly effluent volumes, annual mass emission estimates will be provided for both the average rainfall year and the 95%-ile rainfall year. These will be compared to annual mass emissions from the CSO structures in Islais Creek using previously published overflow characteristics (e.g. CH_2M/Hill '79) [*D. Jones*]

Run NOEL bioassays with *ceriodaphnia* for three wet-weather events. If *ceriodaphnia* protocol not yet in-place, an alternate sensitive bioassay method (e.g. Micro-tox or striped bass) will be used.

DISPERSION STUDY

Mathematically model circulation in Islais Creek with explicit finite difference hydrodynamic model. Mathematical model will be calibrated by short period deployments of current meters and tide gages, as necessary. A finite difference water quality model will then be developed from the hydrodynamic model and calibrated against the results of the 1979 dye study of the Islais Creek wet-weather overflows. [*CH_2M/Hill*]

RECEIVING WATER CHARACTERISTICS

Field monitor surface salinity and pH of the channel at the 3rd St. Bridge following several (3 -5) wet-weather events to determine effluent field dispersion rate. Salinity and pH monitoring will be hourly at three locations across the channel (mid-channel and 40 meters north and south of mid-channel) during normal business hours. [*J. Salerno etal*]

Analyze and summarize BWPC water column data for the Creek. [*J. Salerno etal*]

Discuss '79 CH_2M/Hill dye study of the Islais Creek wet-weather overflow dispersion. [*D.Jones*]

Discuss CH2M/Hill '79, Chapman '86, Rice etal '88, and BWPC findings on benthic conditions in the Creek. [*D. Jones*]

Summarize CH2M/Hill '79 data on fish. [*J. Salerno etal*]

CONCLUSIONS AND RECOMMENDATIONS

Explain any Basin Plan requirement(s) that will not be achieved with a discharge of secondary wet-weather effluent to the Creek, and suggest achievable alternate requirement(s).

Provide descriptions, schematics and line item (major items) cost estimates and planning schedule for all transport, storage treatment and disposal elements of the recommended alternatives for achieving CSO control requirements (1) Assuming a wet-weather exception is obtained and (2) Assuming an exception is not forthcoming. [*HCC, LAV, MMP, DAJ, etal*]

Identify those elements, if any, of the recommended facilities which would be abandoned upon completion of the Master Plan facilities (or new Bay Outfall). [*H. Coffee*]

STUDY SCHEDULE

9/1/88	Submit draft Study Plan to RWQCB staff
10/1/88	RWQCB staff completes their review and returns their comments to CWP
4/1/89*	Draft study report submitted to RWQCB staff for review
6/30/89	Final report and exception request submitted to RWQCB
8/__/89	RWQCB hears exception request as part of a deferred hearing on the re-issuance of the NPDES Permit for the SEWPCP

* Weather permitting

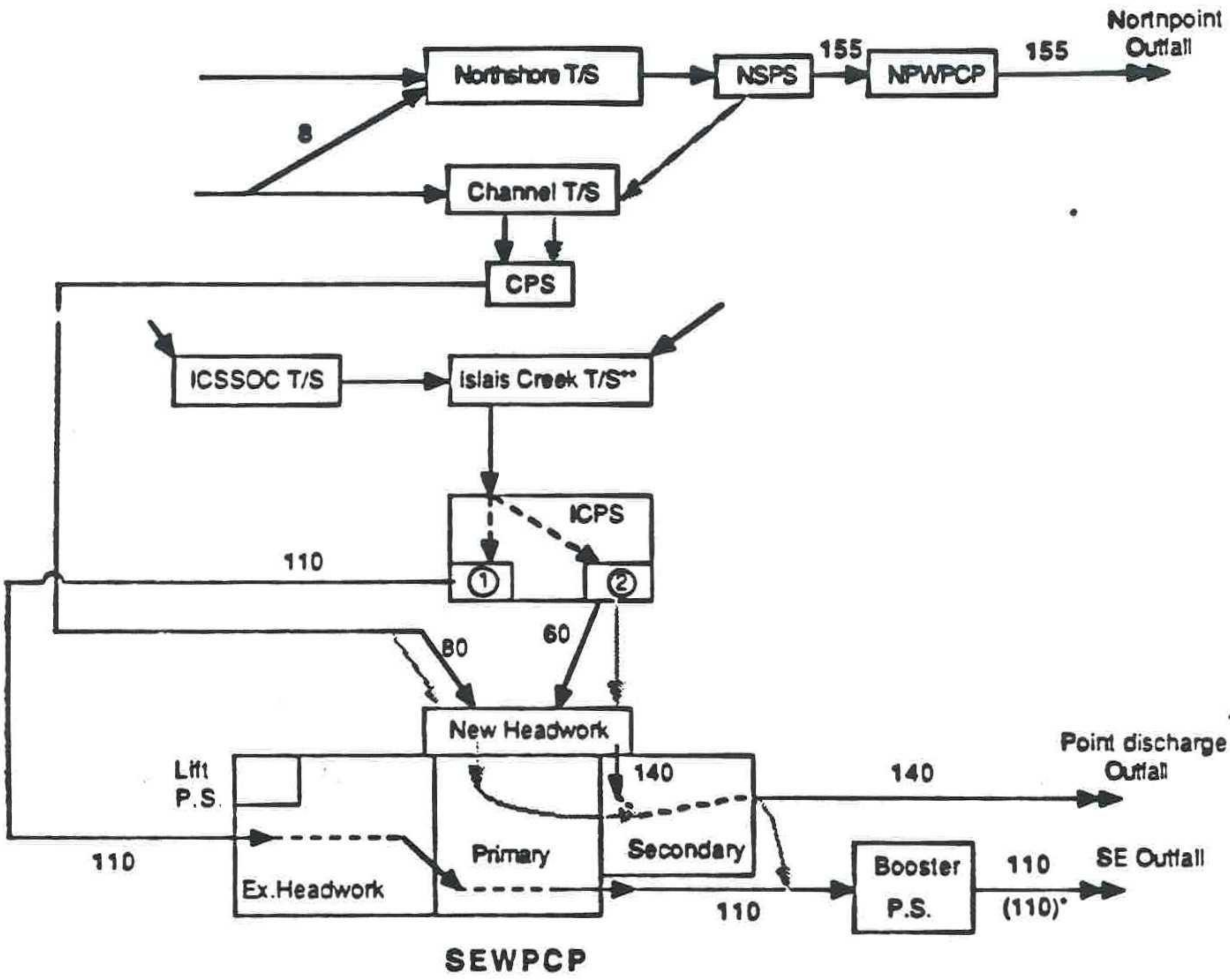
APPENDIX B

ENGINEERING DRAWINGS

Legend

	Outfall
	Dry weather flow
	Wet weather flow
(N)	New
(E)	Exist
(#)*	Max Dry weather flow in Million Gallons per Day (MGD)
#	Wet weather flow in Million Gallons per Day (MGD)
	Control Valve
T/S	Transport/Storage facilities
NSPS	Northshore Pump Station
NPWPCP	Northpoint Water Pollution Control Plant
CPS	Channel Pump Station
ICPS	Islais Creek Pump Station
ICSSOC	Islais Creek Southside Transport/Storage
SEWPCP	Southeast Water Pollution Control Plant
OWPCP	Oceanside Water Pollution Control Plant
BPS	Westside Booster Pump Station
NEPS	Northshore Effluent Pump Station
WSPS	Westside Pump Station
#	Pump Station number
1	Dewatering P.S. to Existing Headwork
2	Dewatering P.S. to New Headwork
3	Effluent P.S. 100-140 mgd to New Bay Outfall
3A	Effluent P.S. 210 mgd to New Bay Outfall
4	Effluent P.S. 110 mgd to Ocean Via Crosstown Force Main
4A	Effluent P.S. 140 mgd to Ocean Via Crosstown Force Main
5	Effluent P.S. 210 mgd to Ocean Via Crosstown Tunnel
5A	Effluent P.S. 320 mgd to Ocean Via Crosstown Tunnel
5B	Effluent P.S. 460 mgd to Ocean Via Crosstown Tunnel

N. Chan 4/20/89

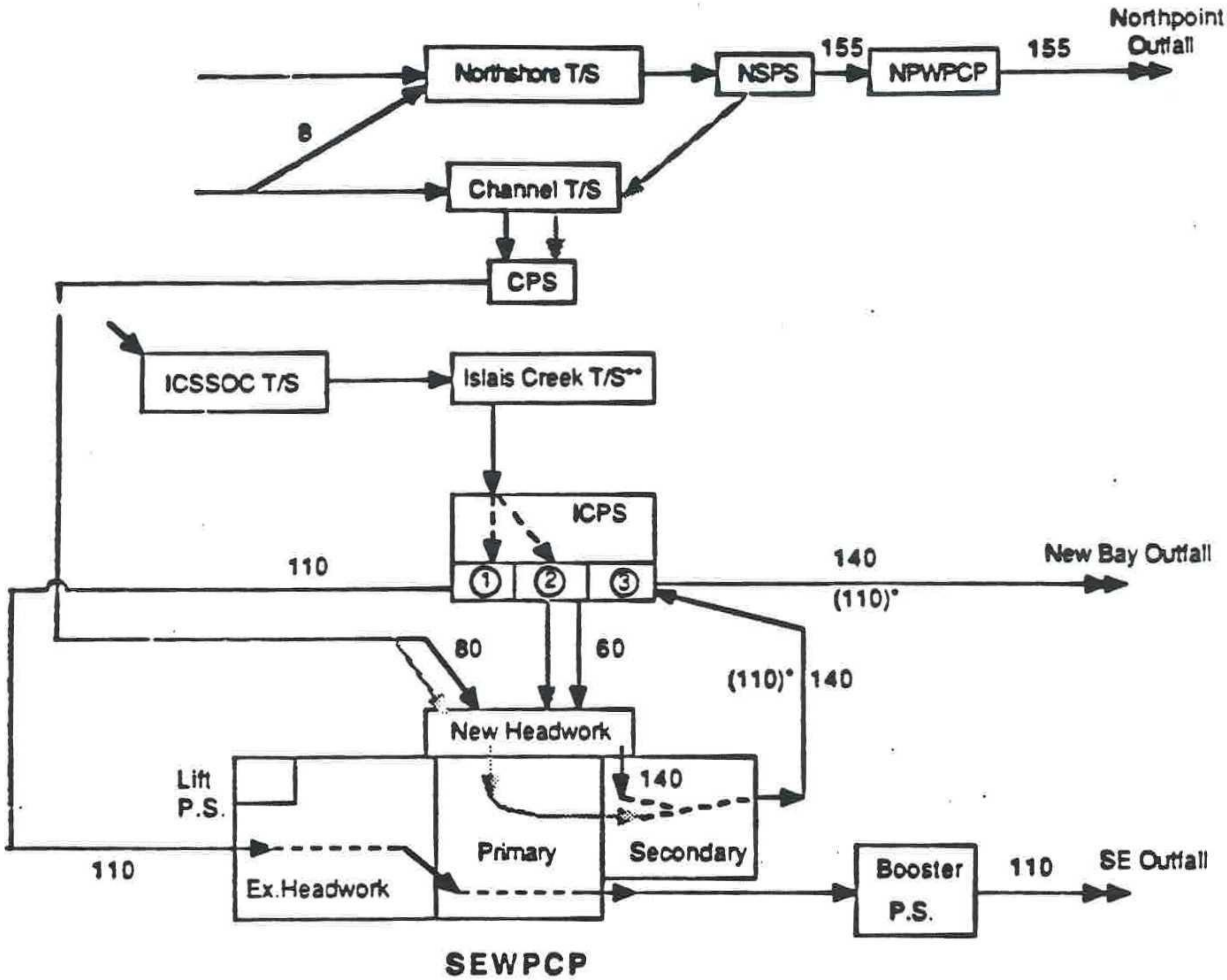


Conceptual Alternative Ac
(Split Flow Option)

* Dry Weather Flow ⟶

** 32.5 Million Gallons of Storage

N. Chan 4/20/89

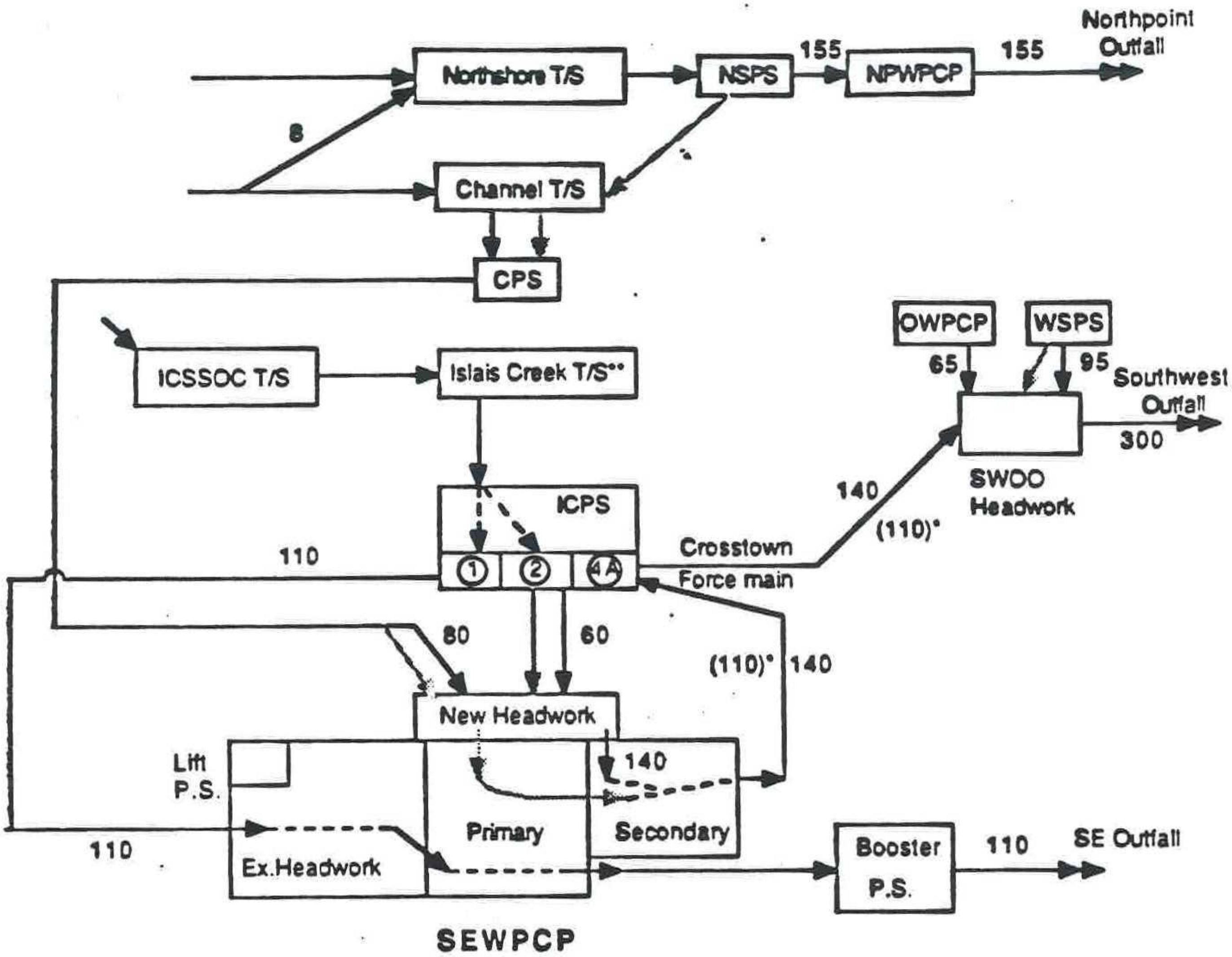


Conceptual Alternative A-1c
(Split flow option)

* Dry Weather Flow ——▶

** 32.5 Million Gallons of Storage

N. Chan 4/20/89

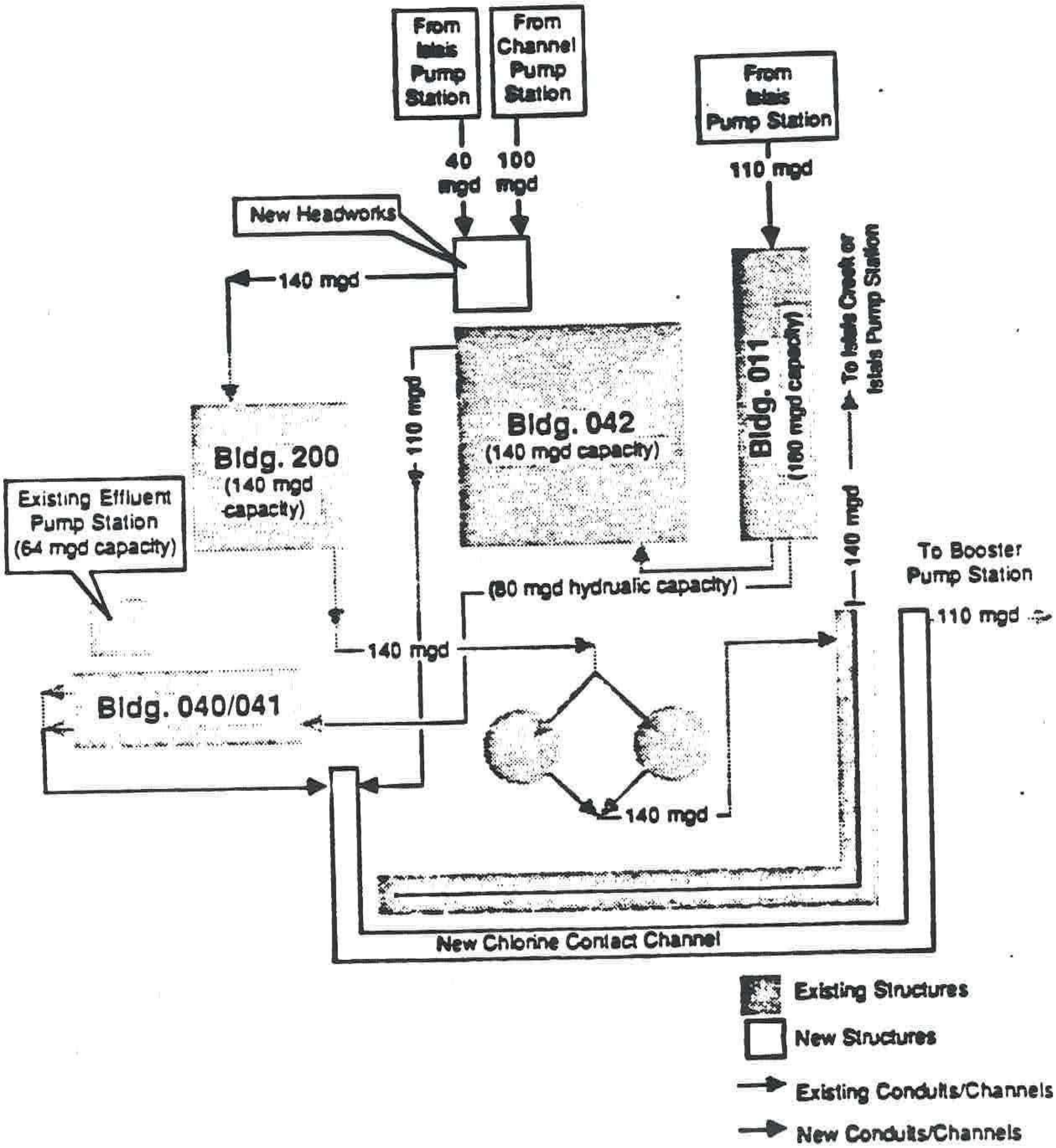


Conceptual Alternative A-2c
(Split flow option)

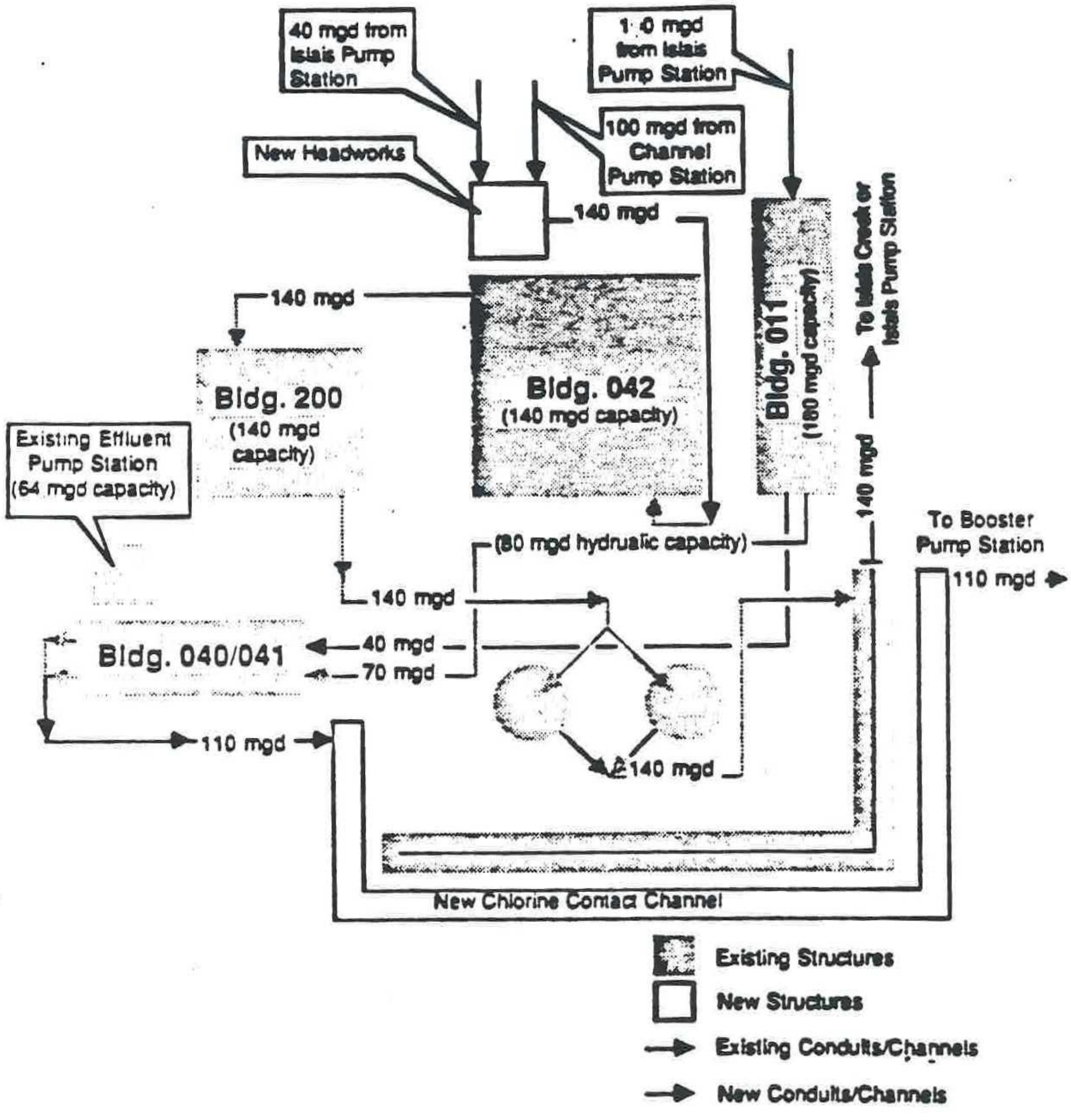
* Dry Weather Flow

** 32.5 Million Gallons of Storage

N. Chan 5/4/89



- Split Flow Alternative
SEWPCP Wet Weather Operations
Flow Capacity at 250 mgd



- Primary Treatment Maximization Alternative
SEWPCP Wet Weather Operations
Flow Capacity at 250 mgd

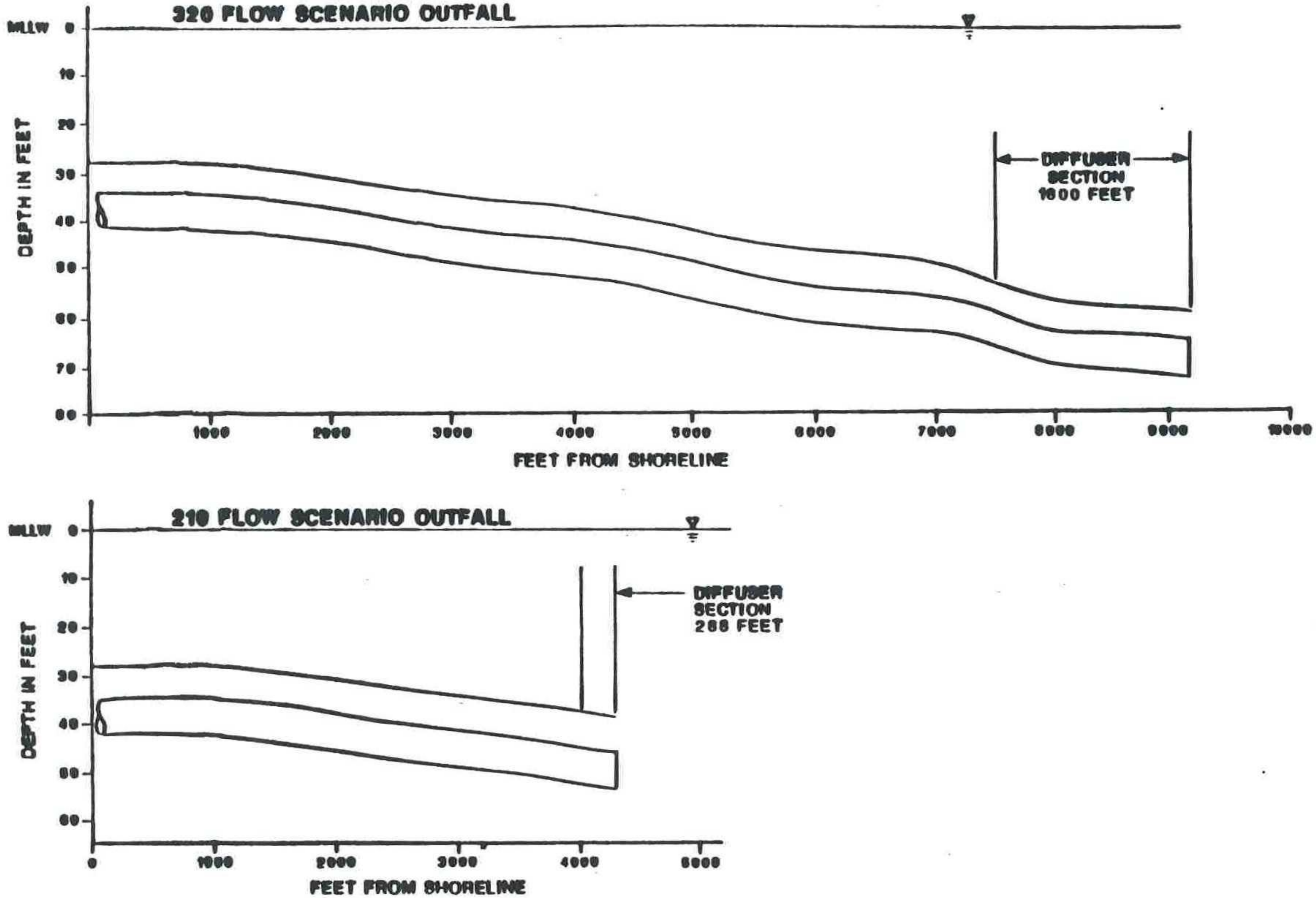
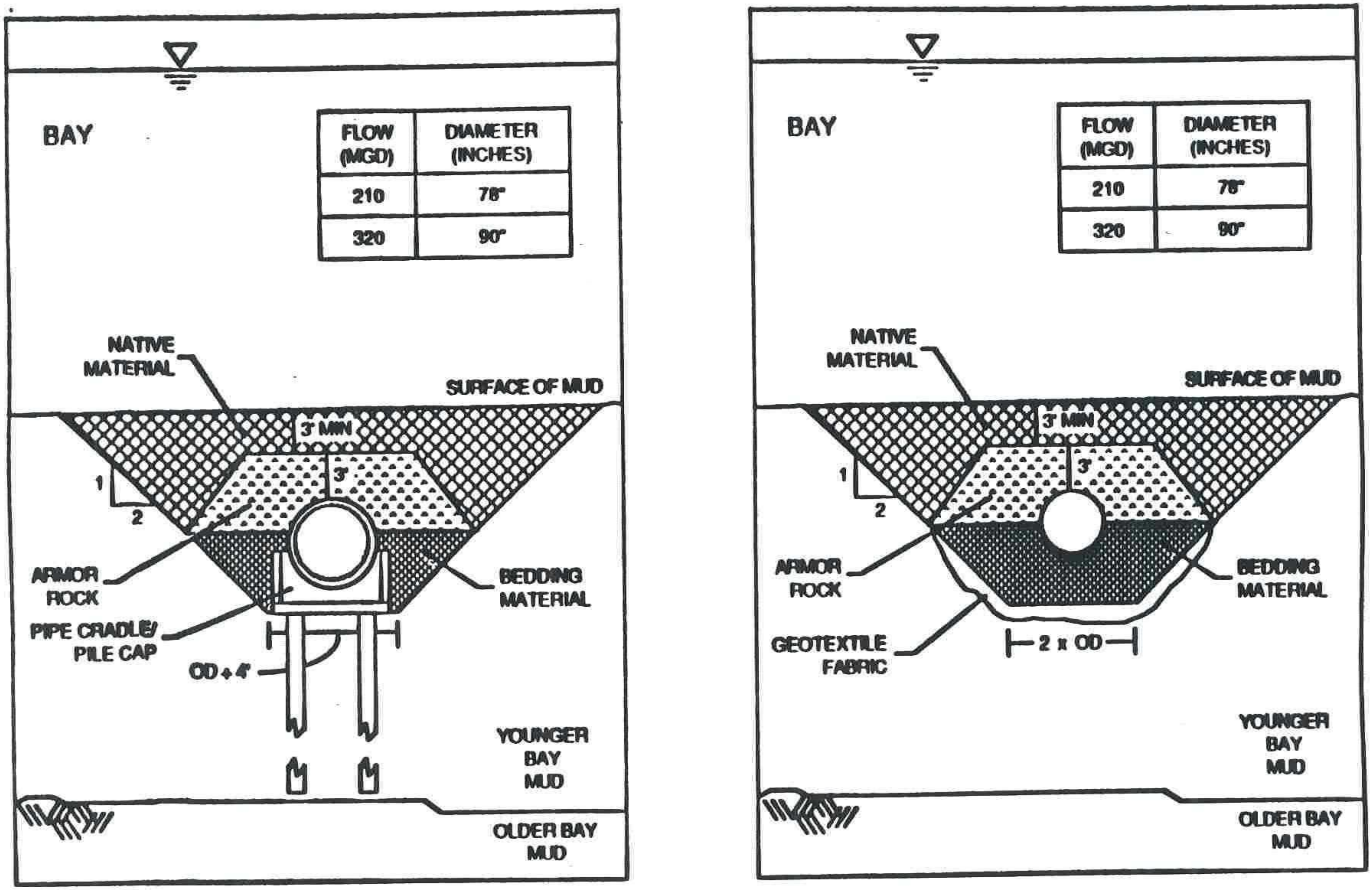


FIGURE 7-4
OUTFALL PROFILES



REINFORCED CONCRETE ON PILES

MORTAR LINED AND COATED STEEL PIPE

FIGURE 7-5

CONSTRUCTION ALTERNATIVES

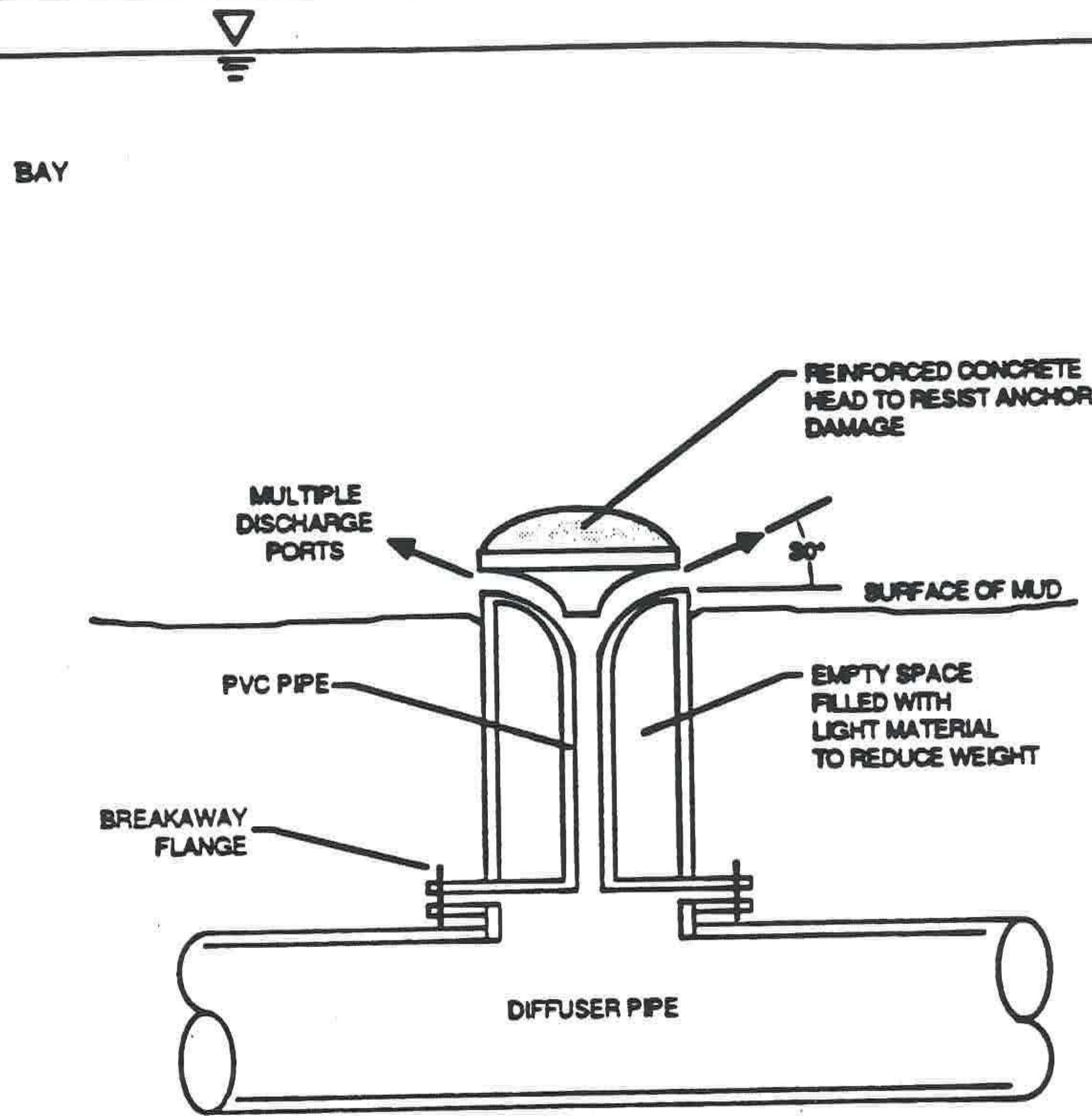


FIGURE 7-6

TYPICAL RISER FOR 320 MGD OUTFALL

A P P E N D I X

E

P R E V I O U S

S T U D I E S

Printed: January 31,1990

APPENDIX E

PREVIOUS STUDIES

Introduction

The purpose of this review of previous studies relating to Islais Creek is to (1) summarize the findings of the studies on Islais Creek and, (2) review these studies to determine whether the discharges to date through the Quint Street Outfall have had a significant impact on the beneficial use of the Creek.

The studies discussed in this Appendix are: (in chronological order of the data collection)

Filice Francis P. Preliminary Report of the Effect of Waste Effluents on the Bottom Fauna in the Islais Creek Vicinity of San Francisco Bay. draft report in letter dated 18 February 1959 to San Francisco Department of Public Works

Engineering Science Incorporated [ESI]. *Characterization and Treatment of Combined Sewer Overflows*. FWPCA Grant WPD 112-01-66. November 1967

Sutton James E. *Survey of Sport Shellfishing Potential in San Francisco Bay in Southern San Francisco County and Northern San Mateo County*. Final Report, December 1978

CH2M-Hill. *Bayside Overflows*. 2 vol. Report for the City and County of San Francisco, June 1979

Chapman Peter M. et al. *A Field Trial of the Sediment Quality Triad in San Francisco Bay*. prepared by EVS Consultants for NOAA, Technical Memorandum NOS OMA 25,Rockville MD, March 1986

San Francisco Bureau of Water Pollution Control [BWPC]. *Bay Benthic Report - San Francisco Bay Outfall Monitoring*. November 1986

Rice David W. et al. Organic Contaminants in Surficial Sediments in San Francisco Bay - Delta. Environmental Science Division, Lawrence Livermore National Laboratory, draft 1.5 November 11, 1987

Phillips. Peter T. *California State Mussel Watch, 10-Year Data Summary, 1977-1987*. State Water Resources Control Board Water Quality Monitoring Report 87-3 May 1988

San Francisco Bureau of Water Pollution Control. Monthly Self-Monitoring Reports 1988 -1989 and unpublished data 1989

Power Elizabeth A. and Peter M. Chapman. *Analysis and Bioassay Testing of Sediments Collected from San Francisco Harbor Approaches to Piers 80 and 94*. EVS Consultants, Seattle, prepared for the San Francisco District U. S. Army Corps of Engineers, May 1988

In September and October 1958, staff of the Southeast WPCP under the direction of Professor Filice, collected benthic grab samples at one hundred and three stations along the easterly waterfront of San Francisco Bay and analyzed these samples for per-cent volatile solids and benthic infauna. The five stations sampled within Islais Creek were totally depauperate. Volatile solids in the sediments ranged from 17.7% to 42.7%

The 1967 ESI study was a CSO characterization study, no sampling was done within the Creek. The 1979 CH2M-Hill study was undertaken during wet-weather conditions several years prior to the activation of the Quint Street outfall. The 1985 NOAA and BWPC field collections were in the summer and fall two years after the Quint Street Outfall was placed in operation. The 1986 LLNL field collection was in February following a period of unusually heavy rainfall.

The locations of the sample collection sites for these studies are shown on Figure E-1. The findings from these studies are discussed by topic in the following sections of this Appendix.

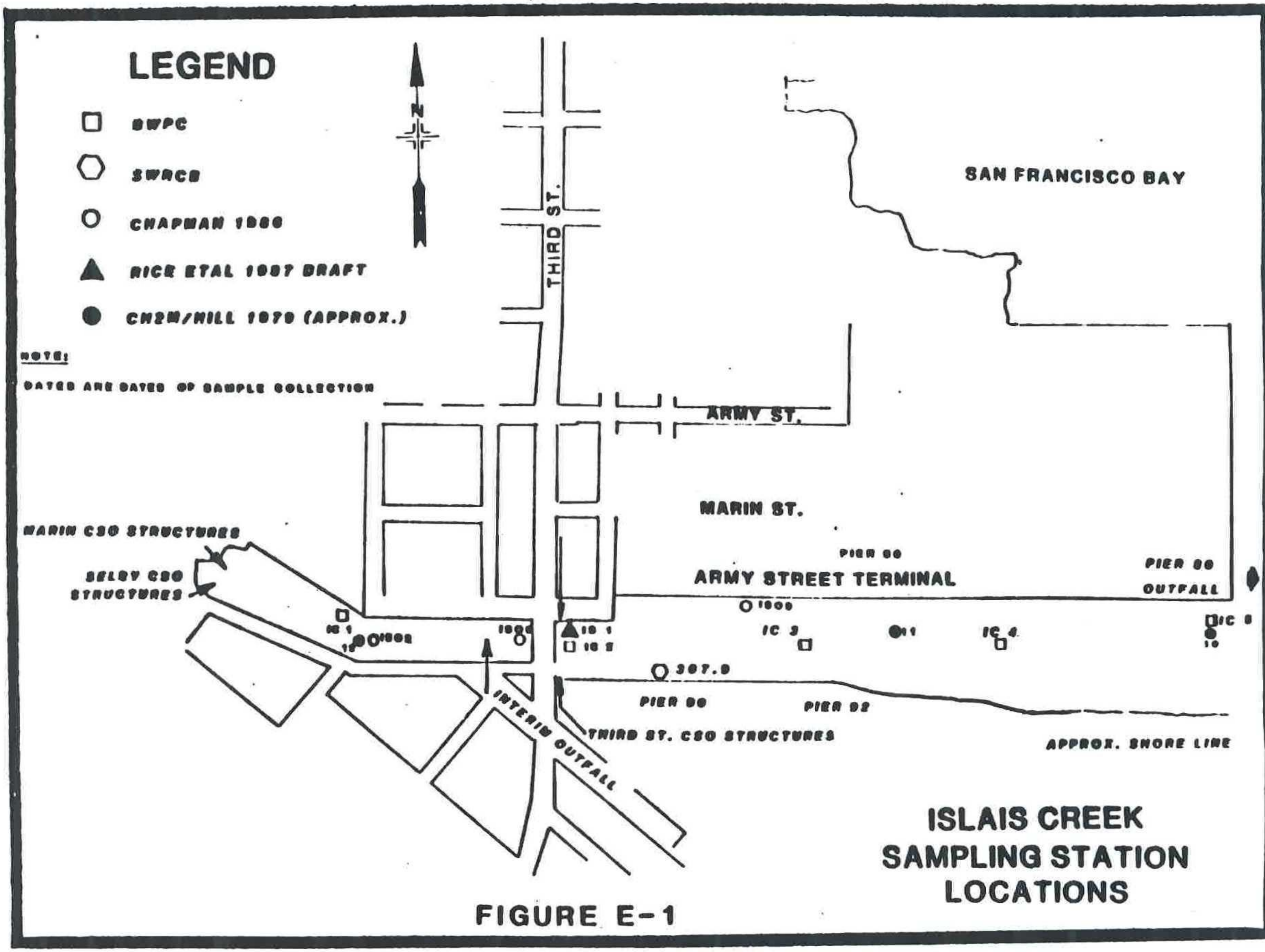
CSO Characteristics

During the 1966-67 wet-weather season, Engineering Science Incorporated (ESI) undertook an extensive characterization study of the City's CSOs (ESI 1967). They collected a total of 120 grab samples during 8 storms at Selby Street using a custom fabricated depth-integrating sampler. In February and March of 1979, CH2M-Hill as part of a study of CSO's impacts on the Bay, collected grab samples during 4 storms from the Selby Street and Marin Street CSO structures using standard ISCO auto-samplers. The CH2M-Hill data is limited to Total Suspended Solids, (N=22), Coliforms (N=22) and Ammonia (N=33, including other CSO points).

There are significant differences in Total Suspended Solids (TSS) data between these two studies. The ESI data yields a flow-weighted TSS concentration of 250 mg/l in the Selby Street CSO, while the CH2M-Hill data averaged 60 mg/l (The CH2M-Hill data sets for Selby and Marin do not differ significantly).

The Program believes the disparity is due to the following factors:

- The ESI data includes data for large and small overflows, as well as both early season (November) and late season (March) events. The CH2M-Hill data is from relatively large, closely spaced storms in February and March.



ISLAIS CREEK SAMPLING STATION LOCATIONS

FIGURE E-1

- The small diameter intake line on the ISCO samplers used by CH2M-Hill could have restricted the collection of large organic material. The ESI sampler extracted a 12" diameter depth-integrated water sample from the flow stream.

Although the ESI data appears to be more representative of annual average overflow characteristics than the CH2M-Hill data, there is no valid reason for excluding the CH2M-Hill data. We therefore averaged the TSS data, weighted on the number of samples in each data set, to develop an estimate of 220 mg/1 average TSS concentration for raw CSO's discharged to Islais Creek. BOD_5 averaged 36 mg/1 in the ESI study.

Water Column Characteristics Following Discharge

In 1979, the Program retained CH2M-HILL to evaluate the impacts of Bayside CSO discharges on the receiving waters. The CH2M-HILL study addressed the major CSO locations south of the Bay Bridge (Mission Creek, Islais Creek, Yosemite Street and Sunnydale Avenue). CH2M-Hill collected pre-storm and post-storm data over a two-month period beginning in February 1979.

During their 1979 study, CH2M-Hill injected Rhodamine dye into the CSO structures at the head end of Islais Creek. The duration of the dye injection was apparently 4 hours. The combined overflow hydrograph during the release showed CSO discharge rates between 150 cfs and almost 1300 cfs (97 MGD to 830 MGD). They measured receiving water dye concentrations during the release and at several intervals during the 12 hours following the end of the dye release. The results of the dye study are shown in Figures III-7 and III-8 (from CH2M-Hill 1979).

The dye data shows that the CSO waste field extends the length of the Creek and is essentially confined to the upper 1 to 2 meters of the water column. The CH2M-Hill Islais Creek data may be a biased estimated of flushing rates as a small overflow began near the end of the post-release sampling which could have accelerated the flushing of the dye from the Creek. However, their dye study at Mission Creek (Channel) undertaken on a different date was able to obtain post-storm data that was not biased by a subsequent overflow. The Mission Creek data showed that the overflow waste field was essentially flushed or diluted to greater than 50:1 dilution within a quarter tidal cycle (6¼ hours) after the cessation of discharge.

The dye measurements made during the release (upper left figure of Figure III-7) showed that once the waste field reached open water at the mouth of the Creek, the surface layer was rapidly diluted with 50:1 dilution being achieved within 1000 feet of the mouth of the Creek.

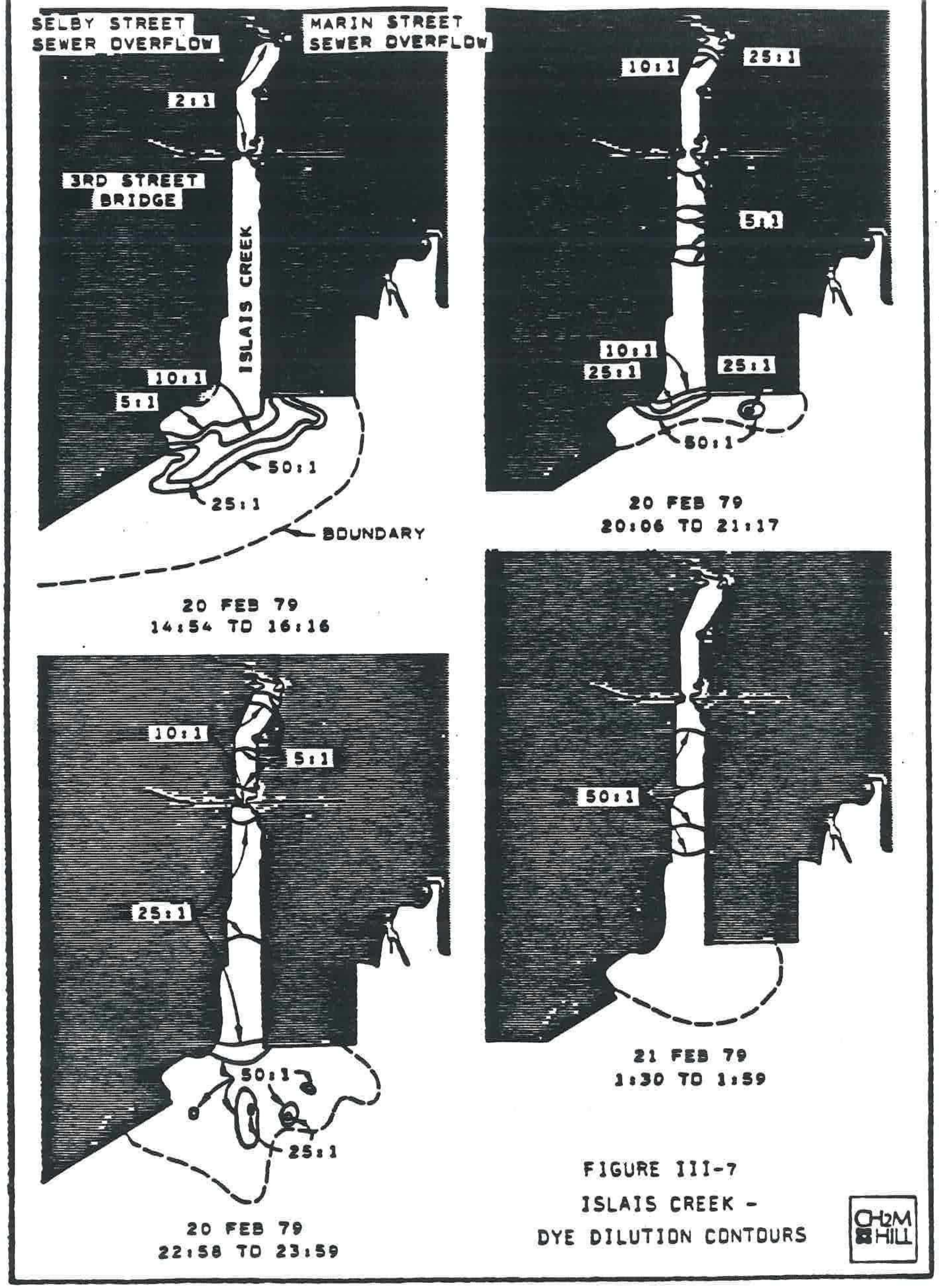


FIGURE III-7
ISLAIS CREEK -
DYE DILUTION CONTOURS

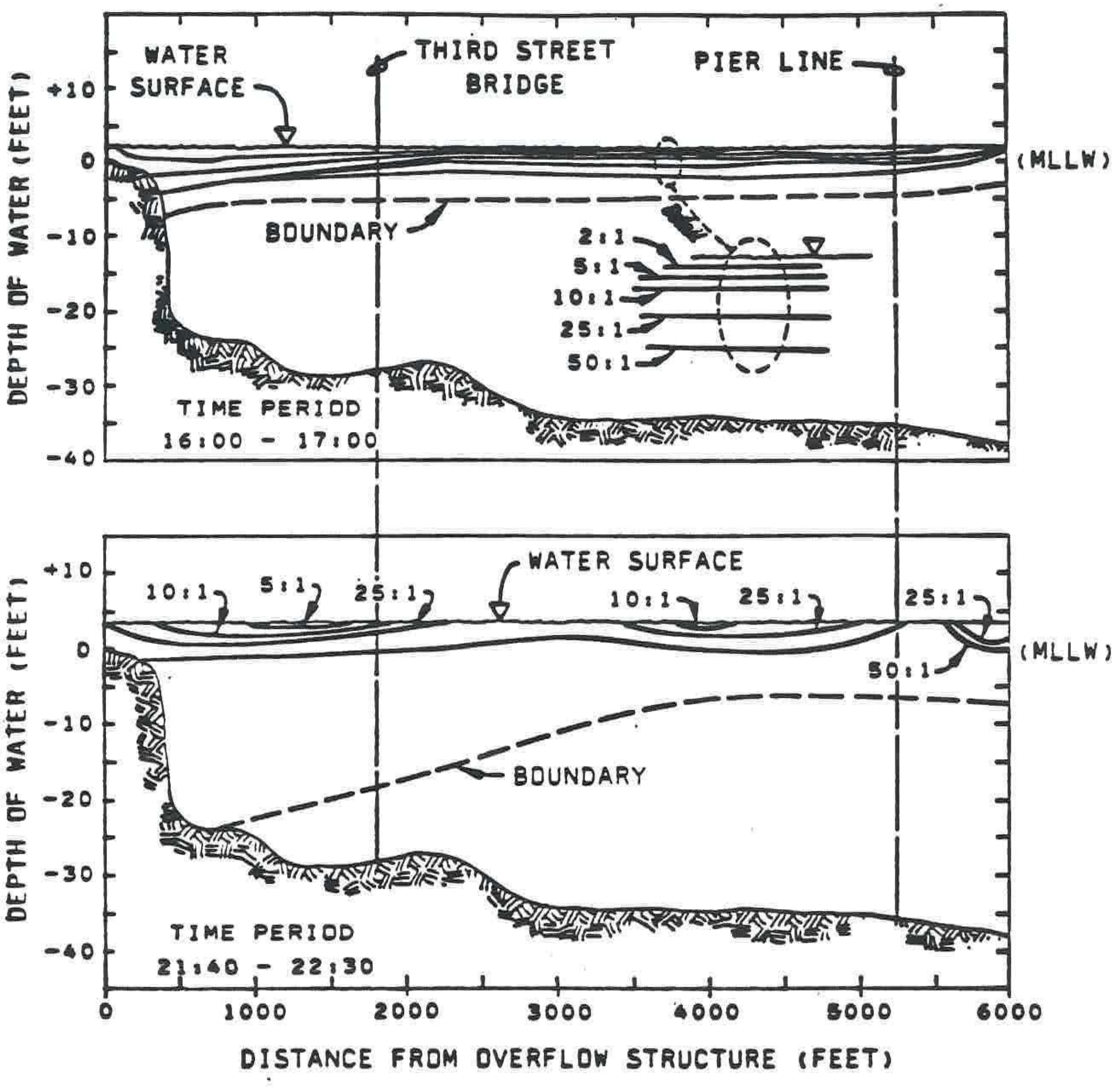


FIGURE III-8
ISLAIS CREEK - DILUTION PROFILES
20 FEBRUARY 1979

CH2M HILL

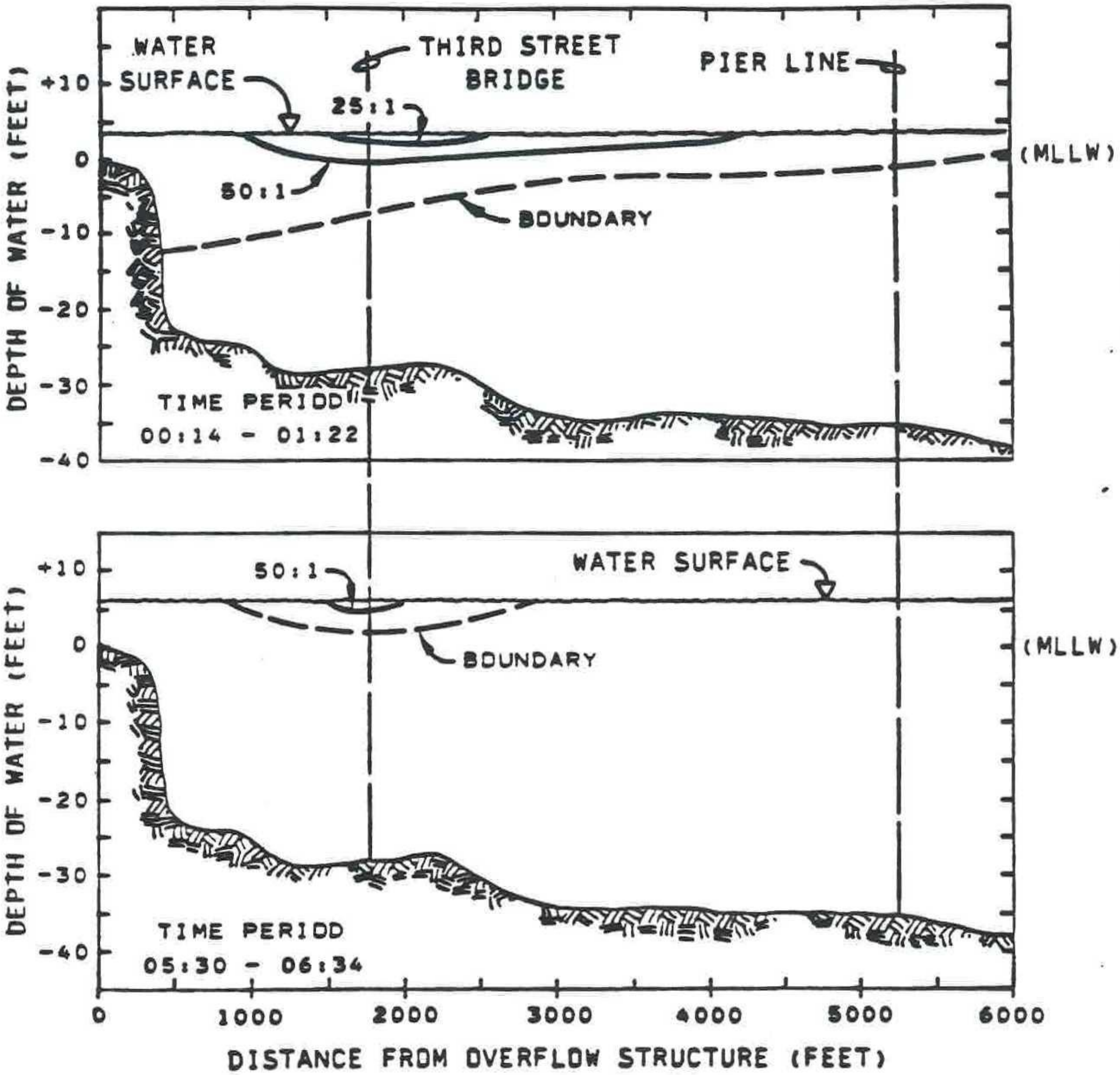


FIGURE III-8(CONTINUED)
ISLAIS CREEK - DILUTION PROFILES
21 FEBRUARY 1979

CH2M HILL

During two periods in 1988, the Pier 80 outfall was taken out of service to accommodate construction work at the Booster Pump Station. On 10 dates during the shut-down of the Pier 80 Outfall, the City's Bureau of Water Pollution Control (BWPC) conducted water quality surveys in Islais Creek to assess the impacts of the Quint Street Outfall discharge on the water quality of the Creek.

The BWPC used the same methodology to assess wet-weather discharge impacts during 3 storms for this study. (One of the shut-down surveys was during wet-weather conditions) Measurements were made at five stations in the Creek. At each station measurements were made at the surface and at descending 3-meter intervals to the seabed and included the following:

Temperature °C	Salinity - ppt
Dissolved Oxygen - mg/l	Total ammonia mg/l*
Total Coliform - mpn/100 ml*	Turbidity - ntu*
Secchi Disk - cm*	Dissolved oxygen mg/l

*At surface only

The survey data suggests that the effluent waste field is essentially confined to the surface. Dissolved oxygen, salinity and temperature at the 3-meter depth were at or near background levels on all occasions. The 3-meter sampling interval does not permit a direct determination on the thickness of the field. However, on several occasions, the surface salinity data was at background level while the ammonia data was indicating 33% to 50% effluent. The design of the oceanographic instrument used in the study is such that the conductivity probe was usually submerged to a 0.3 to 0.5 meter depth during the surface measurements while the water sample collected for lab analysis was taken at the true surface. This seeming anomaly in the data suggests that the effluent field east of the Third Street Bridge can be as thin as 0.3 meter. This hypothesis is consistent with CH2M-Hill 1979 dye study which found that the much larger CSO field from the Selby Street structure was generally confined to the uppermost meter of the water column and their 1989 dispersion study which shows a comparable waste field thickness (Appendix D).

In general, the BWPC data indicated minimal dilution in the surface layer - typically 0.5:1 and 1.5:1 west of the Third Street Bridge and dilutions of between 3:1 and 15:1 east of the Bridge. Dilutions west of the Bridge do not appear correlated with tide stage. Dilutions east of the Bridge, in general, appeared greater on flood tide than ebb tide. These dilutions are consistent with the dilutions observed in the 1989 dispersion study (Appendix D).

Measurements made on September 21, 1988 after cessation of a bypass indicated that the waste field was either flushed from the Creek or diluted to very low levels within the Creek within 1 or 2 tidal cycles after cessation of discharge which again, is consistant with the 1989 dispersion study results (Appendix D).

Attachment E-A contains the data from these 14 field surveys.

Sediments

Table E1 shows levels of total organic carbon (TOC), oil & grease and sulfides in Islais Creek sediments measured by CH2M-Hill from February to April 1979, NOAA (Chapman et al) in July 1985 and the BWPC in September 1985. These data sets show significant decreases in the contamination levels from the head-end of the Creek to the mouth. In general, the contamination levels are lower in the 1985 samples which were collected in the summer and fall than in the winter samples from 1979. The spatial and seasonal gradients in contaminant levels suggest that the large CSO structures at the head of the Creek are the major sources of settleable organic solids.

Table E2 (a corrected version of Table 6-3 from the 1988 James M. Montgomery's Bay Outfall report) shows data on heavy metal levels in Islais Creek sediments. As was the case with the organic contaminants, the metals data shows spatial and seasonal variability which suggests that the CSOs at the head of the Creek are the major sources of heavy metals. This is especially evident in the lead and zinc data, two metals that are usually found at high concentrations in urban runoff.

The single exception to this pattern is the 1985 arsenic data reported by Chapman et al which is approximately one order of magnitude higher than the earlier two data sets and subsequent measurements made near the mouth of the Creek. CH2M-Hill's Islais Creek arsenic data (6.1 to 6.4 µg/l) is comparable to the 2.6 to 4.2 µg/l range of the data from their three nearest offshore stations and is also of the same magnitude as the 7.8 to 8.8 µg/l arsenic levels measured in sediments collected in December 1987 off of the mouth of Islais Creek (Power and Chapman 1988).

Arsenic values (57 to 72 µg/l) from the 1985 study were similar to the 49 to 64 µg/l values at the Oakland site and the 44 to 70 µg/l values for the site of "low chemical contamination" in mid-San Pablo Bay. This suggests that (1) arsenic is not significantly elevated in Islais Creek compared to open water portions of the Bay and (2) the order of magnitude difference between the 1985 data and other three data sets is an analytical problem.

Table E3 is a compilation of data on levels of polynuclear aromatic hydrocarbons (PAHs) in Islais Creek sediments. Lawrence Livermore National Laboratory (LLNL) collected samples in February 1986

TABLE E1

ISLAIS CREEK SEDIMENTS

CONVENTIONAL PARAMETERS

mg/kg Dry Weight

STATION #			TOTAL ORGANIC CARBON (TOC)			OIL & GREASE		SULFIDE	
BWPC	CH2M	NOAA	BWPC*	CH2M	NOAA	BWPC	CH2M	CH2M	NOAA
IC-1	12	IS 02	767	64800	40300	5773	26300	5743	720
IC-2	11	IS 05	469	22100	31400	3380	4000	2285	620
IC-3	--	IS 09	272	--	14400	3681	--	--	260
IC-4	--	--	284	--	--	2266	--	--	--
IC-5	10	--	251	17000	--	1562	2040	429	--

Notes: BWPC data collected September 1985 in upper 14 cm of sediments (BWPC 1986)

* BWPC TOC data is elutriated TOC

CH2M-Hill data collected 2/8/79 to 4/2/80 in upper 10-13 cm of sediments (CH2M-Hill 1979)

NOAA data collected July 1985 in upper 2 cm of sediments (Chapman etal 1986)

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ISLAIS CREEK SEDIMENT METALS CONCENTRATIONS
(MG/KG DRY WEIGHT)

	1979[1] Bayside Stations	1985[2] Triad Stations	1982[3] Southeast Stations		As	Cd	Cr	Cu	Pb	Hg	Ni	Ag	Zn
Head of Creek	12	2	ICO1	1979	6.4	6.5	534.0	184.0	882.0	1.20	112.0	9.0	984.0
				1982	5.5	1.0	29.0	52.0	271.0	0.00	14.0	1.0	188.0
				1985	57.0	1.0	134.0	130.0	223.0	0.57	94.0	8.1	321.0
	11	5	ICO2	1979	6.3	3.5	234.0	83.0	131.0	0.68	130.0	1.8	279.0
				1982	11.8	2.0	52.0	126.0	59.0	0.26	35.0	1.0	112.0
				1985	66.0	<1.0	146.0	98.0	115.0	1.20	96.0	8.6	225.0
		9	ICO3	1982	8.3	3.0	78.0	97.0	59.0	0.52	63.0	3.0	162.0
				1985	72.0	<1.0	110.0	68.0	49.0	0.37	88.0	4.0	156.0
			ICO4	1982	8.0	2.0	72.0	209.0	65.0	1.00	62.0	4.0	95.0
Entrance to Creek	10		ICO5	1979	6.1	2.4	195.0	71.0	77.0	0.62	126.0	1.0	183.0
				1982	11.2	2.0	76.0	37.0	41.0	0.39	59.0	1.0	101.0

Sources:

TABLE E-2

1. Ch2M Hill, 1979.

2. Chapman, 1986.

3. San Francisco BWPC, SEWPCP Monitoring Reports for 1982.

TABLE E3

ISLAIS CREEK SEDIMENTS

POLYNUCLEAR AROMATIC HYDROCARBONS
(PAHs)

mg/kg Dry Weight

POLYNUCLEAR AROMATIC HYDROCARBON	LLNL IS 01	NOAA IS 02	NOAA IS 05	NOAA IS 09	COE Ave.	PUGET SOUND MEDIAN AET	PUGET SOUND EP
Acenaphthene	NR	0.06	0.06	0.03	0.02	>0.65	12
Ancenapthylene	NR	NR	NR	NR	0.01	NR	NR
Anthracene	5.16	1.34	1.14	0.29	0.04	>0.79	21
Benzo(a)anthracene	14.70	1.20	1.14	0.42	0.15	>1.35	470
Benzo(b)flouranthene	10.80	NR	NR	NR	0.30	>6.60	2100
Benzo(k)flouranthene	7.71	NR	NR	NR	<0.02	(See Notes)	
Benzo(g,h,i)perylene	2.28	NR	NR	NR	0.04	>0.80	6300
Benzo(a)pyrene	8.89	1.31	1.20	0.70	0.35	>120	1500
Benzo(e)pyrene	6.65	0.82	0.69	0.30	NR	NR	NR
Chrysene	17.14	2.21	2.13	0.70	0.22	>1.55	360
Flouranthene	23.85	3.83	3.71	0.87	0.41	>1.75	5.2
Indeno(1,2,3-cd)pyrene	NR	NR	NR	NR	0.42	NR	NR
Flourene	NR	0.23	0.21	0.04	<0.01	>0.65	10
1-Methyl naphthalene	NR	0.04	0.04	0.02	NR	NR	NR
2-Methyl naphthalene	NR	0.12	0.13	0.05	NR	>0.80	NR
2,6-Dimethyl naphthalene	NR	0.07	0.06	0.02	NR	NR	NR
2,3,5-Trimethyl naphthalene	NR	0.17	0.16	0.01	NR	NR	NR
1-Methyl phenanthrene	1.72	0.36	0.30	0.06	NR	>0.50	NR
Naphthalene	NR	0.14	0.15	0.09	0.02	NR	NR
Perylene	1.22	0.24	0.22	0.17	NR	NR	NR
Phenanthrene	11.33	0.82	0.51	0.30	0.11	1.9	22
Pyrene	17.90	2.67	2.61	1.29	0.69	>2.10	89.8
Totals	129.35	15.17	14.46	5.39	2.78		

Notes:

LLNL Data is their Sta. IS1 collected 2/87 TOC = 0.356% (Rice June 13, 1989 pers. comm.)

NOAA Data was Collected 7/85 TOC = 4.03%, 3.14%, 1.44% (Chapman etal 1986)

COE Data is the mean of 4 stations offshore of the mouth of Islais Creek
Samples collected 12/29/87 TOC = 1.22% (Power and Chapman 1988)

Puget Sound AET (Apparent Effects Thershold) and
EP (Equilibrium Partitioning) taken from Tetra-Tech 1988 Table 7
AET and EP for benzoflouranthene are total benzoflouranthenes

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following a period of unusually heavy rainfall and probably reflect fresh inputs of PAHs from CSOs (Rice et al noted an "oil sheen" on the surface of their sediment samples at this site). The PAH data appears to follow the same seasonal and spatial patterns previously noted for conventional pollutants and metals.

Table E4 shows levels of a limited number of chlorinated hydrocarbon pesticides and polychlorinated biphenols (PCBs) in Islais Creek sediments. The seasonal and spatial distribution patterns previously noted are less pronounced for these contaminants, possibly due to analytical limitations.

Sediment toxicity

Under a contract with the National Oceanic and Atmospheric Administration, EVS Consultants undertook a demonstration study at three sites in San Francisco Bay to evaluate the interrelationships between sediment chemistry, sediment toxicity (bioassays) and infauna communities. In July 1985, EVS established 10 stations in the Creek from the head end to approximately 1200' west of the Bridge. However, most collections and analytical work was limited to three stations (IS 02, IS 05 & IS 09). Sediment bioassays included amphipod (Survival and avoidance), mussel larvae (survival and abnormalities), clam reburial and copepod (survival and reproductive success). Only the amphipod bioassays were performed on samples from all ten stations (Chapman et al 1986).

The amphipod avoidance, clam reburial and copepod reproduction bioassays were not sensitive in distinguishing sediment quality between the three sites included in this study and will not be considered further.

Table E5 contains normalized bioassay results at the three Islais Creek stations for the three bioassay tests which showed an ability to discriminate between stations with varying degrees of chemical contamination. As was the case with the chemical data, the bioassay results show a head to mouth improvement in sediment quality.

Benthic Infauna

Attachment E-B to this Appendix contains the benthic infauna data sets from CH2M-Hill's 1979 samples, NOAA's July 1985 samples and the BWPC's September 1985 samples.

The stations nearest the head-end of the Creek (CH2M-Hill #12, NOAA IS 09, & BWPC IC 1) have low diversity and low to moderate number of individuals. The opportunistic species *Capitella capitata* dominates the marine infauna at this location. Species diversity and total abundence showed moderate increases at the stations near the Third Street bridge, however, *Capitella capitata* still predomi-

TABLE E4

ISLAIS CREEK SEDIMENTS

CHLORINATED HYDROCARBONS

(ug/kg) Dry Weight

STATION #s				CHLORINATED HYDROCARBONS						
CH2M-HILL	NOAA	LLNL	DATE	Chlordane	TOTAL DDTs	Dieldrin	Heptachlor Epoxide	Lindane	TOTAL PCBs	Trans-Nonochlor
12			1979	--	47	5	--	--	500	
	IC-02		1985	4.26	2.93	--	--	--	180	1.07
11			1979	--	<8.5	0.7	--	--	12	
	IC-08		1985	2.08	3.8	--	--	--	225	0.48
		191	1988	<0.01	94.7	8.4	0.5	<0.01	445	0.2
	IC-09		1985	<0.24	2.24	--	--	--	84	<0.08
10			1979	--	<5	<1	--	--	7	--

Notes:

CH2M-Hill data from CH2M-Hill 1979

NOAA data from Chapman etal 1988

LLNL data from Rice etal 1987

LLNL data converted to dry weight ug/kg by multiplying their ug/g -TOC values by 0.00358 x 1000

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TABLE E5

ISLAIS CREEK SEDIMENTS

BIOASSAY RESULTS

(NORMALIZED TO CONTROLS)

BIOASSAY	IS 02	IS 05	IS 09	SB MEAN	CONTROL
	STATIONS				
AMPHIPOD % SURVIVAL	5.3	80.9	68.1	93.4	100.0
MUSSEL LARVAE					
PERCENT NORMAL	34.9	36.8	73.5	96.0	100.0
RELATIVE % SURVIVAL AT 48 HOURS	6.0	3.2	13.9	63.5	100.0
AVERAGE	15.4	40.3	51.8	84.3	100.0

Notes:

Data from Chapman etal 1986

SB MEAN is the mean of the three stations at the San Pablo Bay site

All results normalized to % survival or % normal in the controls

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nates at this location.

The infauna at the outward stations in all data sets show increasing species diversity, few *Capitella capitata* and increasing presence of some less pollution tolerant species such as *Ampelisca abdita* (*A. milleri* in CH2M-Hill). However, not all data sets showed increased abundance at the outward stations.

The overall higher number of individuals and generally greater diversity in the 1985 collections possibly reflect seasonal variability in infauna populations.

The seasonal and spatial variability in infauna characteristics appears to correlate well with the other indices of contamination and also appears to be related to the CSOs.

Shellfish

There are only scattered populations of bay mussels (*Mytilus edulis*) in Islais Creek. There is one small clam bed along the north bank of the Creek immediately east of the Third Street Bridge. In 1978 this 210 m^2 bed contained an estimated 1200 legal size (>38mm shell length) Japanese littleneck clams (*Tapes japonica*, now known as *Tapes philippinarum*) and 14,400 juveniles of three clam species (*Tapes japonica*, *Macoma nasuta* and *Macoma inquinata*). This area is the only area within the Creek with appropriate substrate conditions for the Japanese Littleneck clam. The Littleneck clam appears to be the only species utilized for either food or bait. Sutton observed signs that fishermen occasional take these clams for use as bait (Sutton, 1978).

In January 1987, the State Mussel Watch Program retrieved samples of transplanted California mussels (*Mytilus californianus*) which had been deployed in the Creek over the previous 4 months at a site approximately 600 feet east of the Third Street Bridge. Tissue analytes included 7 metals, 21 pesticides (not including isomers and metabolites) and 2 PCB's (Phillips 1988).

The Food and Drug Administration (FDA) has set Action levels (or Tolerance Levels) applicable to shellfish for eleven trace organics and one metal (methyl mercury). The National Academy of Sciences has recommended lower levels for two of the organics (DDT and PCB), and the California Department of Health Services (DHS) publishes advisories for mercury at a lower level than the FDA Action Level.

The State Mussel Watch Program (SMW) compares their data against Median International Standards (MIS) which they calculated from a 1983 United Nations compilation of international standards for seafood quality. The MIS values are indicative of possible health effects, however, they have no legal significance in California.

The SMW also calculates Elevated Data Levels (EDLs) and tags their data compilations to indicate whether and when the tissue concentrations exceed the 85 percentile or 95 percentile level of all data gathered statewide. The EDLs simply indicate higher than usual levels, "...EDLs do not assess adverse impacts, and do not necessarily represent concentrations which would be damaging to the mussel or render them unfit for human consumption" (Phillips 1988).

Table E-6 contains the SMW data for the mussels deployment near the Third Street Bridge along with the lowest of FDA, DHS, NAS or NIS human health criteria and the SMW EDL-85 Values. There were no analytes above any of the human health criteria. Silver, mercury and chlorpyrifos are the 3 analytes which exceed the SMW EDL-85. levels. The chlorpyrifos level was trivial (less than 1 µg/kg).

Fisheries

On April 6, 1979, CH2M-Hill made two bottom trawls in Islais Creek, the Inside trawl was just west of the Third Street Bridge and the outside trawl was made over the easterly 600 feet of the Creek. The inside trawl yielded 88 fish, all juveniles or small adults and all but 3 were anchovies.

The outside trawl was more productive, yielding the following:

Species	Number
Northern Anchovy	4
Night Smelt	18
Plainfin Midshipman	3
White Croaker	3
Shiner Surfperch	20
English Sole	34
Brown Rockfish	5
Staghorn Sculpin	6
Yellow Fin Goby	2

As with the inside trawl, the majority of the fish were juveniles.

Forty shrimp (*Cragon fransicorum*) were also netted during the outside trawl.

No signs of abnormalities were noted on any fish.

Tissue levels of heavy metals were measured in 3 samples of English Sole and 1 sample of Staghorn Sculpin. None of the levels were exceptional. Fish tissue data, however, often is a poor indicator of localized contamination as fish are transients.

TABLE 6

ISLAIS CREEK

STATE MUSSEL WATCH DATA

TRANSPLANTED CALIFORNIA MUSSELS

COLLECTED 1/21/87

METALS (mg/kg)

ELEMENT	TISSUE CONC.	EDL 85	EQUIV. CONC.	HEALTH CRITERIA	SOURCE
	Dry Weights		Wet-Weights		
CADMIUM	4.21	10.83	0.7	1	MIS
CHROMIUM	2.82	3.93	0.5	1	MIS
COPPER	8.29	21.85	1.4	2	MIS
LEAD	3.27	11.01	0.5	2	MIS
MERCURY	0.71	0.44	0.1	0.5	DHS
SILVER	3.55	0.7	0.6	--	
ZINC	139	336	23.2	70	MIS

ORGANICS (ug/kg wet-weight)

COMPOUND	TISSUE CONC.	EDL 85	HEALTH CRITERIA	SOURCE
ALDRIN	ND	MDL	300	FDA
CHLORBENSIDE	ND	6.2		
TOTAL CHLORDANE	5.1	192		
TOTAL NONACHLOR	1.9	--		
CHLORPYRIFOS	0.9	MDL		
CHLORDENE	0.4	--		
DACTHAL	ND	9.2		
TOTAL DDT	14.9	1483	1000	NAS
DIAZINON	ND	MDL		
DIELDRIN	6.3	67	300	FDA
ENDRIN	ND	MDL	300	FDA
TOTAL ENDOSULFAN	0.3	17		
ETHYL PARATHION	ND	--		
METHYL PARATHION	ND	MDL		
TOTAL HCH (inc. Lindane)	0.6	8.5		
HEPTACHLOR	ND	MDL	300	FDA
HEPTOCHLOR EPOXIDE	ND	1.4	300	FDA
HEXACHLOROBENZENE	ND	0.2		
METHOXYCHLOR	ND	--		
TOTAL PCB	61.6	1420	500	NAS
TETRADIFON	ND	MDL		
TOXAPHENE	ND	MDL	5000	FDA

Note: Equiv. Wet Wt. Conc. = 1/6 Dry Wt. Conc.
MDL = Method Detection Limit

ATTACHMENT E - A

ISLAIS CREEK

WATER COLUMN DATA

ISLAIS CREEK WASTEFIELD CHARACTERIZATION STUDY
DATE: 16 FEBRUARY 1988

STATION	STATION DEPTH	SAMPLE DEPTH (m)	SECCHI (cm)	TEMP. (C)	D.O. mg/l	D.O. %sat	CONDUCTIVITY siemens	SALINITY (ppt)	pH	TOTAL COLIFORM (mpn)	TURBIDITY (ntu)	TOTAL NH3-N mg/l	NON-DIS. NH3-N mg/l
IC-01		0.0	110	16.2	5.7	63	24900	15.0	6.36	1300	4.0	13.00	0.014
		3.0		12.4	7.5	86	46800	30.3	7.53				
		6.0		12.1	7.3	82	47100	30.6	7.80				
		9.0		12.0	7.1	80	47600	31.0	7.80				
IC-02		0.0	100	15.9	5.6	62	25600	15.3	6.21	170	6.0	11.90	0.011
		3.0		12.3	7.1	80	46400	30.1	7.53				
		6.0		12.0	7.1	80	47200	30.6	7.83				
		9.0		11.9	7.0	79	47700	31.0	7.84				
		12.0		11.9	6.8	76	47900	31.2	7.86				
IC-03		0.0	110	13.2	7.4	84	44900	28.5	7.00	170	6.0	3.00	0.023
		3.0		12.0	7.5	84	47300	30.7	7.80				
		6.0		11.9	7.3	82	47900	31.2	7.83				
		9.0		11.8	7.2	81	48300	31.5	7.84				
		12.0		11.8	7.1	80	49100	32.0	7.86				
IC-04		0.0	100	12.8	7.7	87	44000	28.7	7.06	330	5.0	6.00	0.043
		3.0		12.0	7.7	86	47400	30.5	7.80				
		6.0		11.9	7.5	84	48000	31.2	7.83				
		9.0		11.8	7.4	83	48300	31.5	7.86				
		12.0		11.8	7.3	82	48800	32.0	7.87				
		15.0		11.7	7.2	81	49200	32.2	7.88				
IC-05		0.0	110	13.7	6.8	77	42200	27.2	6.71	50	5.0	4.00	0.013
		3.0		12.0	7.7	86	47400	30.1	7.82				
		6.0		12.0	7.6	86	47900	30.1	7.84				
		9.0		11.8	7.4	83	48600	31.7	7.86				
		12.0		11.7	7.2	81	49100	32.0	7.87				
MEAN			105	12.3	7.2	81	46205	29.9	7.46		5.3		
STANDARD DEVIATION			6	1.0	0.5	5	6155	3.7	0.39		0.8		
MINIMUM			100	11.7	5.6	62	25600	15.3	6.21	50	4.0	3.00	0.011
MAXIMUM			110	15.9	7.7	87	49200	32.2	7.88	330	6.0	13.00	0.043

High Slack @ Start
of EBB -Dry Weather

ISLAIS CREEK WASTEFIELD CHARACTERIZATION STUDY
DATE: 16 FEBRUARY 1988

STATION	STATION DEPTH	SAMPLE DEPTH (m)	SECCHI (cm)	TEMP. (C)	D.O. mg/l	D.O. %sat	CONDUCTIVITY siemens	SALINITY (ppt)	pH	TOTAL COLIFORM (mpn)	TURBIDITY (ntu)	TOTAL NH3-N mg/l	NON-DIS. NH3-N mg/l
IC-01		0.0	90	15.4	6.9	84	24900	14.5	6.89	2400	5.0	12.50	0.015
		3.0		12.3	6.5	90	47900	31.9	7.52				
		6.0		12.2	7.1	89	47900	31.1	7.51				
IC-02		0.0	100	16.1	5.9	65	23300	14.1	6.23	220	5.0	3.80	0.137
		3.0		12.4	7.5	85	47100	30.6	7.35				
		6.0		12.1	8.0	90	48400	31.6	7.32				
		9.0		12.0	8.1	92	48800	31.8	7.31				
		12.0		11.9	8.0	91	49500	32.2	7.31				
IC-03		0.0	90	13.1	7.4	85	46400	30.5	7.44	210	6.0	1.60	0.025
		3.0		12.2	7.9	89	47900	31.3	7.61				
		6.0		12.1	7.9	89	48200	31.4	7.57				
		9.0		12.0	7.8	88	48300	31.4	7.61				
		12.0		12.0	7.8	88	48800	31.7	7.63				
IC-04		0.0	100	14.1	6.8	74	38900	24.8	6.60	50	5.0	5.60	0.014
		3.0		12.2	7.4	83	47400	30.9	7.63				
		6.0		12.1	7.4	84	48100	31.3	7.63				
		9.0		12.1	7.5	85	48300	31.5	7.65				
		12.0		12.0	7.3	83	48900	31.7	7.66				
IC-05		0.0	90	12.9	7.1	80	45200	29.2	7.20	80	5.0	1.20	0.012
		3.0		12.2	7.0	79	48000	31.1	7.57				
		6.0		12.0	7.1	80	48800	31.7	7.63				
		9.0		11.9	6.9	78	49100	32.1	7.67				
		12.0		11.8	7.9	89	49500	32.3	7.60				
MEAN			95	12.5	7.4	84	46284	30.0	7.44		5.3		
STANDARD DEVIATION			6	1.0	0.6	7	8033	4.2	0.38		0.5		
MINIMUM			90	11.8	5.9	65	23300	14.1	6.23	50	5.0	1.20	0.012
MAXIMUM			100	16.1	8.1	92	49500	32.2	7.67	2400	6.0	12.50	0.137

High Slack @
End of Flood - Possible
Small O' Flow

ISLAIS CREEK WASTEFIELD CHARACTERIZATION STUDY
DATE: 22 FEBRUARY 1989

STATION	STATION DEPTH	SAMPLE DEPTH (m)	SECCHI (cm)	TEMP. (C)	D.O. mg/l	D.O. %sat	CONDUCTIVITY umhos	SALINITY (ppt)	pH	TOTAL COLIFORM (mpn)	TURBIDITY (ntu)	TOTAL NH3-N mg/l	NON-DIS. NH3-N mg/l
IC-01		0.0	130	16.1	6.0	65	21900	13.0	6.47	330	3.3	15.10	0.027
		3.0		12.3	7.2	82	48300	32.2	7.59				
		6.0		12.0	7.0	80	50300	32.9	7.63				
IC-02		0.0	100	16.4	6.4	71	24600	14.5	6.43	330	4.0	12.30	0.020
		3.0		12.3	6.8	78	48200	32.0	7.62				
		6.0		12.0	7.0	80	50200	32.7	7.63				
		9.0		12.0	7.1	81	50300	32.9	7.64				
IC-03		0.0	110	12.6	6.8	77	45200	30.3	7.33	50	4.0	1.40	0.018
		3.0		12.2	6.7	76	48300	32.2	7.54				
		6.0		12.0	6.9	78	49900	32.6	7.64				
		9.0		11.9	7.0	80	50100	32.9	7.67				
IC-04		0.0	110	13.6	6.6	75	42400	28.0	6.70	<20	4.0	3.10	0.025
		3.0		12.1	7.4	84	49000	31.9	7.67				
		6.0		12.1	7.2	82	49500	32.3	7.65				
		9.0		12.0	7.0	80	50200	32.8	7.68				
		12.0		11.9	6.9	79	50400	33.0	7.68				
IC-05		0.0	100	13.4	6.6	76	46100	27.4	6.93	330	3.0	5.60	0.027
		3.0		12.2	7.1	81	49000	31.9	7.58				
		6.0		12.0	7.3	83	49300	32.2	7.66				
		9.0		11.9	7.0	80	50100	32.8	7.65				
		12.0		11.8	6.9	79	50400	33.1	7.66				
MEAN			105	12.5	6.9	79	47341	30.6	7.46		3.8		
STANDARD DEVIATION			8	1.1	0.3	3	6251	4.6	0.39		0.5		
MINIMUM			100	11.9	6.4	71	24600	14.5	6.43	50	3.0	1.40	0.018
MAXIMUM			110	16.4	7.4	84	50400	33.0	7.68	330	4.0	15.10	0.027

@ Begining of
Flood - Dry
Weather

ISLAIS CREEK WASTEFIELD CHARACTERIZATION STUDY
DATE: 23 FEBRUARY 1993

STATION	STATION DEPTH	SAMPLE DEPTH (m)	SECCHI (cm)	TEMP. (C)	D.O. mg/l	D.O. %sat	CONDUCTIVITY siemens	SALINITY (ppt)	pH	TOTAL COLIFORM (mpn)	TURBIDITY (ntu)	TOTAL NH3-N mg/l	NON-DIS. NH3-N mg/l
IC-01		0.0	120	16.0	6.3	80	23300	14.1	6.56	130	4.0	12.72	0.027
		3.0		12.6	7.2	83	50700	30.2	7.50				
IC-02		0.0	120	16.7	5.9	66	24300	14.8	6.49	130	3.0	11.82	0.022
		3.0		12.4	7.2	83	50800	33.3	7.50				
		6.0		12.1	6.9	79	51400	33.8	7.82				
IC-03		0.0	140	13.5	6.3	80	48200	31.4	7.20	230	2.0	10.98	0.121
		3.0		12.3	7.1	81	51200	33.6	7.62				
		6.0		12.1	7.0	81	51900	34.1	7.65				
		9.0		12.0	7.0	81	51700	34.0	7.66				
IC-04		0.0	140	13.0	7.0	81	49400	32.3	7.41	330	3.0	10.80	0.171
		3.0		12.3	7.3	84	50900	33.4	7.66				
		6.0		12.1	7.3	83	51300	33.7	7.69				
		9.0		12.0	7.2	83	51600	33.9	7.70				
		12.0		11.9	7.1	82	52300	34.4	7.71				
IC-05		0.0	150	12.6	6.6	76	50600	33.2	7.64	230	3.0	7.38	0.200
		3.0		12.2	7.4	86	51200	33.6	7.70				
		6.0		12.0	7.4	84	51400	33.8	7.72				
		9.0		12.0	7.2	83	51600	33.9	7.73				
		12.0		11.9	6.5	80	52100	34.3	7.73				
MEAN			138	12.6	7.0	81	48356	32.3	7.56		2.8		
STANDARD DEVIATION			13	1.2	0.4	5	8754	4.7	0.31		0.5		
MINIMUM			120	11.9	5.9	66	24300	14.8	6.49	130	2.0	7.38	0.022
MAXIMUM			150	16.7	7.4	86	52300	34.4	7.73	330	4.0	12.72	0.200

Ebbing - Dry
Weather

ISLAIS CREEK WASTEFIELD CHARACTERIZATION STUDY
DATE: 29 FEBRUARY 1988

STATION	STATION DEPTH	SAMPLE DEPTH (m)	SECCHI (cm)	TEMP. (C)	D.O. mg/l	D.O. %sat	CONDUCTIVITY siemens	SALINITY (ppt)	pH	TOTAL COLIFORM (mpn)	TURBIDITY (ntu)	TOTAL NH3-N mg/l	NON-DIS NH3-N mg/l
IC-01		0.0	90	15.1	8.3	86	19000	10.8	6.49	>24000	6.0	0.41	0.015
		3.0		12.9	8.4	99	52700	34.7	7.40				
IC-02		0.0	100	16.4	7.2	80	23600	14.3	6.42	>24000	4.8	0.41	0.013
		3.0		12.7	8.1	93	49100	32.1	7.53				
		6.0		12.6	8.2	96	53400	35.2	7.60				
		9.0		12.4	8.1	95	53300	35.2	7.63				
IC-03		0.0	110	14.1	8.3	95	42900	27.6	6.71	>24000	3.0	3.53	0.011
		3.0		12.6	8.6	101	53300	35.2	7.60				
		6.0		12.5	8.3	97	53300	35.2	7.64				
		9.0		12.4	8.0	94	53600	35.4	7.63				
		12.0		12.4	8.0	94	53600	35.4	7.64				
IC-04		0.0	120	12.9	7.9	92	50400	33.0	7.20	>24000	3.0	4.92	0.048
		3.0		12.5	8.5	99	53000	34.9	7.63				
		6.0		12.4	8.4	98	53500	35.3	7.63				
		9.0		12.4	8.3	97	53900	35.6	7.65				
		12.0		12.3	8.3	97	54000	35.7	7.66				
IC-05		0.0	120	14.4	8.3	95	41600	26.7	6.93	>24000	3.0	3.92	0.016
		3.0		12.5	8.6	100	53000	34.9	7.62				
		6.0		12.4	8.5	99	53600	35.4	7.65				
		9.0		12.3	8.3	98	53700	35.5	7.67				
		12.0		12.2	8.3	98	54500	36.0	7.68				

	SECCHI	TEMP.	D.O. mg/l	D.O. %sat	CONDUCTIVITY	SALINITY	pH	TOTAL COLIFORM	TURBIDITY	TOTAL NH3-N	NON-DIS NH3-N
MEAN	113	12.9	8.2	96	50156	32.9	7.44		3.3		
STANDARD DEVIATION	10	1.1	0.3	5	7580	6.4	0.38		0.5		
MINIMUM	100	12.3	7.2	80	23600	14.3	6.42	>24000	3.0	3.53	0.011
MAXIMUM	120	16.4	8.6	101	54000	35.7	7.67	>24000	6.0	0.41	0.048

@ Start of Ebb - Very wet on 2/28

ISLAIS CREEK WASTEFIELD CHARACTERIZATION STUDY
DATE: 2 MARCH 1988

STATION	STATION DEPTH	SAMPLE DEPTH (m)	SECCHI (cm)	TEMP. (C)	D.O. mg/l	D.O. %sat	CONDUC TIVITY siemens	SALINITY (ppt)	pH	TOTAL COLIFORM (mpn)	TURB-IDITY (ntu)	TOTAL NH3-N mg/l	NON-DIS. NH3-N mg/l
IC-01		0.0	120	15.8	8.7	82	38200	12.1	8.41	2400	3.9	11.80	0.018
		3.0		13.0	6.3	72	46600	30.3	7.90				
IC-02		0.0	120	16.3	6.8	64	21800	13.1	7.38	2200	4.8	10.82	0.151
		3.0		12.9	7.5	85	46500	30.2	7.86				
		6.0		12.8	7.3	83	46800	30.4	7.88				
		9.0		12.7	7.1	81	47100	30.6	7.82				
IC-03		0.0	120	14.2	7.9	90	41300	26.5	6.82	1800	4.8	8.23	0.033
		3.0		12.9	7.8	87	46700	30.3	7.89				
		6.0		12.8	7.5	85	46800	30.4	7.83				
		9.0		12.8	7.5	85	46700	30.3	7.84				
		12.0		12.8	7.3	85	47000	30.6	7.83				
IC-04		0.0	130	14.9	7.1	80	35400	22.3	7.81	780	4.0	6.12	0.151
		3.0		12.8	7.2	82	46800	30.4	7.81				
		6.0		12.7	7.2	82	46900	30.5	7.84				
		9.0		12.7	7.2	82	46800	30.5	7.84				
		12.0		12.7	7.1	81	46800	30.5	7.84				
IC-05		0.0	130	13.7	6.9	78	41800	26.8	6.99	700	5.0	1.88	0.009
		3.0		12.8	7.1	81	46800	30.4	7.58				
		6.0		12.2	7.2	81	47200	30.7	7.62				
		9.0		12.4	7.1	80	47400	30.9	7.62				
		12.0		12.4	7.1	81	47800	31.1	7.62				
MEAN			125	13.3	7.2	81	43888	28.4	7.51		4.3		
STANDARD DEVIATION			6	1.0	0.4	5	6707	4.7	0.28		0.5		
MINIMUM			120	12.7	5.8	64	21800	13.1	6.82	700	4.0	1.88	0.009
MAXIMUM			130	16.3	7.8	87	47100	30.6	7.94	2400	5.0	11.80	0.151

High Slack - Dry
Weather

ISLAIS CREEK WASTEFIELD CHARACTERIZATION STUDY   Time = 9 AM
DATE: 12 SEPTEMBER 1988

STATION	STATION DEPTH	SAMPLE DEPTH (m)	SECCHI (cm)	TEMP. (C)	D.O. mg/l	D.O. %sat	CONDUCTIVITY siemens	SALINITY (ppt)	pH	TOTAL COLIFORM (cfu)	TURBIDITY (ntu)	TOTAL NH3-N mg/l	NON-DIS. NH3-N mg/l
IC-01	8.7	0.0	80	20.0	6.9	83	25200	15.3	6.21	200	5.0	10.85	0.010
		3.0		17.5	6.2	80	51000	32.3	7.35				
		6.0		17.2	6.3	81	51200	33.5	7.41				
IC-02	9.6	0.0	80	21.0	8.3	80	24200	14.5	6.17	3200	6.0	13.83	0.012
		3.0		17.4	8.0	77	51000	33.4	7.39				
		6.0		17.2	7.9	80	$\boxed{50900}$	33.6	7.45				
		9.0		17.2	7.6	82	$\boxed{51100}$	33.5	7.46				
IC-03	9.7	0.0	110	18.1	6.3	81	48200	31.2	7.23	ND	4.0	4.53	0.045
		3.0		17.5	6.6	85	50800	33.4	7.48				
		6.0		17.3	6.6	84	51000	33.4	7.49				
		9.0		17.2	6.6	84	51100	33.5	7.49				
IC-04	12.0	0.0	100	18.2	6.5	83	48600	29.6	6.97	280	4.0	2.41	0.013
		3.0		17.8	6.7	87	50900	33.4	7.51				
		6.0		17.5	6.6	85	50800	33.4	7.50				
		9.0		17.1	6.6	84	51000	33.4	7.50				
		12.0		16.9	6.6	84	51100	33.5	7.50				
IC-05	12.0	0.0	110	18.3	6.6	84	45000	29.1	6.88	42	4.0	2.76	0.012
		3.0		17.7	6.7	86	50900	33.4	7.50				
		6.0		17.8	6.7	87	51000	33.5	7.52				
		9.0		17.4	6.6	85	50800	33.3	7.50				
		12.0		16.9	6.6	84	51100	33.3	7.50				
MEAN			96	17.8	6.8	83	47852	31.1	7.29		4.6	5.88	0.018
STANDARD DEVIATION			13	1.0	0.6	3	7872	5.5	0.40		0.9	5.16	0.015
MINIMUM			80	16.9	6.2	77	24200	14.5	6.17	42	4.0	2.41	0.010
MAXIMUM			110	21.0	8.3	87	51200	33.6	7.52	3200	6.0	13.83	0.045

mid-flood to HHW
of + 5.2

ISLAIS CREEK WASTEFIELD CHARACTERIZATION STUDY Time = 9 AM
DATE: 14 SEPTEMBER, 1988

STATION	STATION DEPTH	SAMPLE DEPTH (m)	SECCHI (cm)	TEMP. (C)	D.O. mg/l	D.O. %sat	CONDUCTIVITY siemens	SALINITY (ppt)	pH	TOTAL COLIFORM (cfu)	TURBIDITY (ntu)	TOTAL NH3-N mg/l	NON-DIS. NH3-N mg/l
IC-01	2.2	0.0	60	18.6	6.5	83	18000	10.7	6.80	360	4.0	17.00	0.015
IC-02	10.0	0.0	70	21.8	6.0	74	21000	12.7	6.12	400	5.0	15.40	0.012
		3.0		17.9	6.4	83	51800	34.1	7.40				
		6.0		17.4	6.9	82	51900	34.0	7.44				
		9.0		17.2	6.1	78	51900	34.1	7.43				
IC-03	8.5	0.0	120	19.0	5.8	74	44300	28.8	6.65	6	5.0	2.81	0.007
		3.0		18.0	6.2	81	51900	34.1	7.43				
		6.0		17.7	6.1	79	51800	34.0	7.44				
IC-04	12.0	0.0	100	19.2	5.8	74	42700	27.9	6.51	280	5.0	1.49	0.003
		3.0		17.7	6.0	78	51500	34.0	7.41				
		6.0		17.7	6.1	79	51600	34.0	7.45				
		9.0		17.3	6.3	81	51900	34.2	7.47				
		12.0		17.0	5.9	75	52000	34.2	7.43				
IC-05	10.7	0.0	80	18.7	6.0	77	46200	29.9	6.76	400	5.0	2.81	0.010
		3.0		17.8	6.2	81	51700	34.0	7.44				
		6.0		17.7	6.2	80	51800	34.2	7.45				
		9.0		17.5	6.1	79	51800	34.1	7.45				
MEAN			93	18.1	6.1	78	48488	31.8	7.21		5.0	5.83	0.008
STANDARD DEVIATION			22	1.2	0.3	3	7932	5.5	0.43		0.0	6.54	0.004
MINIMUM			70	17.0	5.8	74	21000	12.7	6.12	6	4.0	1.49	0.003
MAXIMUM			120	21.8	6.9	83	52000	34.2	7.47	400	5.0	17.00	0.015

18000 10.7

Early flood to HHW 6f +5.5

ISLAIS CREEK WASTEFIELD CHARACTERIZATION STUDY

Time: 9 AM

DATE: 19 SEPTEMBER, 1988

STATION	STATION DEPTH	SAMPLE DEPTH (m)	SECCHI (cm)	TEMP. (C)	D.O. mg/l	D.O. %sat	CONDUC TIVITY siemens	SALINITY (ppt)	pH	TOTAL COLIFORM (cfu)	TURB-IDITY (ntu)	TOTAL NH3-N mg/l	NON-DIS. NH3-N mg/l
IC-01	1.6	0.0	105	18.2	6.4	61	17100	9.9	6.90	<100	6.0	17.50	0.021
IC-02	10.2	0.0	90	21.5	6.4	70	22500	13.3	6.08	420	6.0	12.90	0.009
		3.0		18.0	6.8	89	51800	34.2	7.47				
		6.0		17.8	6.4	83	51800	34.1	7.45				
		9.0		17.6	6.2	80	51900	34.1	7.43				
IC-03	11.4	0.0	130	18.4	6.7	88	50500	32.4	7.35	<100	4.0	5.80	0.077
		3.0		17.9	6.9	90	51800	34.1	7.49				
		6.0		17.8	6.9	90	51700	34.0	7.49				
		9.0		17.8	6.8	88	51800	34.0	7.49				
IC-04	12.0	0.0	130	18.7	6.8	88	48100	31.3	7.01	<100	4.0	4.80	0.029
		3.0		17.9	6.9	90	51800	34.0	7.48				
		6.0		17.8	6.8	90	51800	34.1	7.49				
		9.0		17.8	6.8	88	51700	34.0	7.49				
		12.0		17.2	6.0	77	51800	34.0	7.48				
IC-05	12.0	0.0	140	18.7	6.8	87	48300	29.7	6.74	<100	4.0	3.00	0.010
		3.0		17.4	7.1	91	51400	33.7	7.50				
		6.0		17.6	6.9	89	51700	34.0	7.49				
		9.0		17.7	6.7	87	51900	34.1	7.49				
		12.0		17.3	6.7	86	51700	34.1	7.47				
MEAN			123	18.1	6.7	87	49241	32.5	7.32		4.5	6.63	0.031
STANDARD DEVIATION			22	1.0	0.3	4	7176	6.0	0.38		1.0	4.34	0.032
MINIMUM			90	17.2	6.0	77	22500	13.3	6.08	<100	4.0	3.00	0.009
MAXIMUM			140	21.5	7.1	91	51900	34.2	7.50	420	6.0	17.50	0.077

mid ebb between LHW of +4.2 and HLW of +3.9

ISLAIS CREEK WASTEFIELD CHARACTERIZATION STUDY

Time = 11AM

DATE: 21 SEPTEMBER, 1988

STATION	STATION DEPTH	SAMPLE DEPTH (m)	SECCHI (cm)	TEMP. (C)	D.O. mg/l	D.O. %sat	CONDUCTIVITY siemens	SALINITY (ppt)	pH	TOTAL COLIFORM (cfu)	TURBIDITY (ntu)	TOTAL NH3-N mg/l	NON-DIS. NH3-N mg/l
IC-01	4.7	0.0	150	18.2	5.9	77	52100	34.4	7.42	16	3.0	<1.00	<0.016
		3.0		17.4	5.7	74	52200	34.2	7.43				
IC-02	11.5	0.0	160	17.9	5.9	90	51200	33.5	7.34	540	3.0	1.03	0.013
		3.0		17.5	5.8	72	52300	34.5	7.44				
		6.0		17.5	5.6	73	52400	34.7	7.45				
		9.0		17.2	5.5	71	52300	34.4	7.45				
IC-03	9.0	0.0	110	18.2	6.4	84	52100	34.2	7.47	8	4.0	<0.100	<0.017
		3.0		17.7	6.3	82	52400	34.4	7.48				
		6.0		17.6	6.0	78	52400	34.6	7.47				
		9.0		17.4	5.9	76	52600	34.6	7.47				
IC-04	13.4	0.0	150	17.8	6.6	86	51800	34.3	7.46	5	4.0	<1.00	<0.017
		3.0		17.8	6.5	85	52300	34.3	7.50				
		6.0		17.6	6.4	83	52400	34.4	7.50				
		9.0		17.5	6.1	79	52700	34.5	7.48				
		12.0		17.0	6.0	77	52500	34.5	7.49				
IC-05	13.1	0.0	130	17.8	6.4	83	51600	34.1	7.47	6	4.0	<1.00	<0.018
		3.0		17.6	6.3	82	52200	34.2	7.48				
		6.0		17.6	6.3	82	52300	34.4	7.49				
		9.0		17.5	6.2	80	52600	34.8	7.51				
		12.0		17.0	6.1	78	52500	34.5	7.48				
MEAN			138	17.6	6.1	80	52241	34.4	7.47		3.75	<1.00	<0.017
STANDARD DEVIATION			22	0.3	0.3	5	384	0.3	0.04		0.50		
MINIMUM			110	17.0	5.5	71	51200	33.5	7.34	5	3.00	<1.00	<0.016
MAXIMUM			160	18.2	6.6	90	52700	34.8	7.51	540	4.00	1.03	<0.018

early ebb between LHW of +4.7 & HLW of +3.1

Last discharge on 9/19

ISLAIS CREEK WASTEFIELD CHARACTERIZATION STUDY
DATE: 15 NOVEMBER 1986

STATION	STATION DEPTH	SAMPLE DEPTH (m)	SECCHI (cm)	TEMP. (C)	D.O. mg/l	D.O. %sat	CONDUCTIVITY siemens	SALINITY (ppt)	pH	TOTAL COLIFORM (cfu)	TURBIDITY (ntu)	TOTAL NH3-N mg/l	NON-DIS. NH3-N mg/l
IC-01	6.1	0.0	140	15.0	4.6	59	49700	33.2	7.00	>16000	5.0	0.57	0.003
		3.0		15.2	4.8	59	51800	33.8	7.14				
IC-02	9.0	0.0	130	14.8	4.5	52	41800	27.1	6.62	>16000	4.0	1.95	0.004
		3.0		15.0	5.8	71	51600	34.0	7.22				
		6.0		15.0	5.9	72	51800	34.1	7.25				
		9.0		14.9	5.9	72	52000	34.2	7.26				
IC-03	10.0	0.0	120	15.2	6.5	79	50500	33.4	7.11	>16000	4.0	0.83	0.006
		3.0		14.9	6.6	81	51800	34.1	7.27				
		6.0		15.2	6.6	82	51800	34.1	7.27				
		9.0		14.9	6.4	78	52100	34.2	7.28				
IC-04	12.0	0.0	120	15.1	6.4	78	50700	33.2	7.22	>16000	4.0	0.66	0.007
		3.0		14.9	6.6	81	51700	34.1	7.30				
		6.0		14.9	6.6	81	51900	34.2	7.30				
		9.0		14.9	6.4	78	52100	34.3	7.31				
		12.0		14.5	5.8	70	52500	34.5	7.37				
IC-05	11.3	0.0	120	15.1	6.9	84	50100	33.2	7.24	>16000	4.0	0.55	0.006
		3.0		14.5	7.1	86	51400	33.7	7.31				
		6.0		14.6	7.1	86	51800	33.9	7.34				
		9.0		14.8	7.0	85	52000	34.2	7.33				
MEAN			123	14.9	6.4	77	51035	33.6	7.24		4.0	1.00	0.006
STANDARD DEVIATION			5	0.2	0.6	8	2460	1.7	0.17		0.0	0.65	0.001
MINIMUM			120	14.5	4.5	52	41800	27.1	6.62	>16000	4.0	0.55	0.003
MAXIMUM			130	15.2	7.1	86	52500	34.5	7.37	>16000	5.0	1.95	0.007

ISLAIS CREEK WASTEFIELD CHARACTERIZATION STUDY
DATE: 23 NOVEMBER, 1988

STATION	STATION DEPTH	SAMPLE DEPTH (m)	SECCHI (cm)	TEMP. (C)	D.O. mg/l	D.O. %sat	CONDUCTIVITY siemens	SALINITY (ppt)	pH	TOTAL COLIFORM (cfu)	TURBIDITY (ntu)	TOTAL NH3-N mg/l	NON-DIS. NH3-N mg/l
IC-01	6.0	0.0	35	14.4	7.1	72	11800	6.3	6.90	(NOT REQUIRED)		0.55	0.002
		3.0		14.1	4.9	58	48200	32.2	7.14				
		6.0		13.9	4.3	51	50400	33.0	7.17				
IC-02	12.0	0.0	40	15.2	7.8	81	14800	6.4	6.11			2.76	0.002
		3.0		13.4	6.7	76	48800	32.3	7.29				
		6.0		13.8	5.8	69	50400	32.9	7.31				
		9.0		13.4	6.3	74	50200	32.9	7.34				
		12.0		13.6	5.4	64	50900	33.3	7.27				
IC-03	12.0	0.0	60	14.6	7.0	80	36500	24.7	6.61			1.96	0.005
		3.0		14.2	6.9	82	50000	32.7	7.29				
		6.0		13.9	7.2	85	50000	32.8	7.31				
		9.0		13.8	7.4	88	50400	33.0	7.33				
		12.0		13.7	7.4	87	50300	33.1	7.33				
IC-04	12.0	0.0	60	14.4	6.1	70	41300	28.4	6.89			1.92	0.009
		3.0		13.9	6.1	72	50100	32.8	7.31				
		6.0		13.8	6.3	75	50200	32.9	7.33				
		9.0		13.8	6.3	75	50400	32.9	7.33				
		12.0		13.7	6.1	72	50500	33.1	7.32				
IC-05	12.0	0.0	60	14.7	6.7	78	41600	26.7	6.58			2.81	0.006
		3.0		13.8	7.1	84	50000	32.7	7.33				
		6.0		13.7	7.1	84	50200	32.9	7.35				
		9.0		13.7	7.1	84	50600	33.1	7.39				
		12.0		13.7	7.1	91	51000	33.3	7.40				
MEAN			55	14.0	6.7	78	46842	30.5	7.16			2.36	0.006
STANDARD DEVIATION			10	0.5	0.6	7	8597	6.0	0.35			0.49	0.003
MINIMUM			40	13.4	5.4	64	14800	6.4	6.11			0.55	0.002
MAXIMUM			60	15.2	7.8	88	50900	33.3	7.39			2.81	0.009

ISLAIS CREEK WASTEFIELD CHARACTERIZATION STUDY
DATE: 19 DECEMBER, 1988

STATION	STATION DEPTH	SAMPLE DEPTH (m)	SECCHI (cm)	TEMP. (C)	D.O. mg/l	D.O. %sat	CONDUCTIVITY siemens	SALINITY (ppt)	pH	TOTAL COLIFORM (cfu)	TURBIDITY (ntu)	TOTAL NH3-N mg/l	NH_3 (ug/l)
IC-01	3.8	0.0	20	13.8	8.0	85	17700	9.7	7.13			2.18	16
		3.0		11.8	6.1	69	50800	33.4	7.35				
IC-02	10.0	0.0	30	15.7	8.3	89	20400	12.1	6.50			14.90	30
		3.0		11.5	7.4	83	51500	33.5	7.40				
		6.0		11.0	7.3	81	51800	33.8	7.46				
		9.0		10.9	7.6	84	52000	33.4	7.48				
IC-03	9.0	0.0	60	13.5	7.4	81	30000	22.4	6.86			9.20	19
		3.0		11.5	7.4	83	51000	33.3	7.41				
		6.0		11.0	7.5	84	51500	33.8	7.48				
		9.0		11.0	7.4	83	51900	34.0	7.49				
IC-04	10.3	0.0	80	13.2	7.1	78	35600	23.4	6.62			0.66	1
		3.0		11.5	7.3	82	50600	33.2	7.42				
		6.0		11.0	7.3	81	51800	33.9	7.50				
		9.0		11.0	7.3	81	52000	34.0	7.51				
IC-05	9.6	0.0	80	12.3	7.4	83	46300	30.7	7.04			0.55	3
		3.0		11.4	7.6	85	50700	33.4	7.46				
		6.0		11.2	7.6	85	51400	33.9	7.50				
		9.0		11.0	7.4	83	51700	33.9	7.50				
MEAN			55	11.8	7.5	83	47450	30.8	7.27			6.33	
STANDARD DEVIATION			21	1.3	0.3	2	8731	6.2	0.37			7.01	
MINIMUM			30	10.9	7.1	78	20400	12.1	6.50			0.55	
MAXIMUM			80	15.7	8.3	89	52000	34.0	7.51			14.90	

ATTACHMENT E - B

ISLAIS CREEK

BENTHIC INFAUNA

Station 12

Species	Number Per 0.05 Meter**2 Per Sampling Period I		II		III		IV		V		Mean	Median	S. D.
Polychaeta				3							0.30	0.00	0.95
Pholoe minuta				1							0.10	0.00	0.32
Capitella capitata			2		1		2	1			0.60	0.00	0.84
Oligochaeta													
Pelecypoda			1								0.10	0.00	0.32
unid. Gastropoda eggs													
Crustacea		1					1		2		0.40	0.00	0.70
Ampelisca Milleri			1								0.10	0.00	0.32
Crangonyx sp.													
Insecta				1							0.10	0.00	0.32
Hydrophorus sp.			25	17					1		4.30	0.00	9.01
Psychoda alternata			4	3			1				0.80	0.00	1.40
Psychoda severini								1			0.10	0.00	0.32
unid. Diptera puparium			1								0.10	0.00	0.32
unid. Diptera larvae													

TOTALS	I		II		III		IV		V	
Number of Individuals (for Rep)	0	1	34	25	1	0	4	2	3	0
Number of Species (for Rep)	0	1	6	5	1	0	3	2	2	0
Number of Individuals (for Period)		1		59		1		6		3
Number of Species (for Period)		1		9		1		4		2
Number of Individuals for Station	70									
Number of Species for Station	11									
Shannon-Weiner Species Diversity (H')LN	0		.99		0		.87		.32	

Station 11

Species	Number Per 0.05 Meter**2 For Sampling Period I		II		III		IV		V		Mean	Median	S. D.
Polychaeta													
Harmothoe sp.			2							1	0.30	0.00	0.67
Pholoe minuta									1		0.10	0.00	0.32
Eteone pacifica								1			0.10	0.00	0.32
Nephtys caecoides		1									0.10	0.00	0.32
Nephtys cornuta franciscana				1							0.10	0.00	0.32
Schistomeringos cf. rudolphi					2				2		0.40	0.00	0.84
unidentified Dorvillid		1									0.10	0.00	0.32
Leitoscoloplos pugettensis									1		0.10	0.00	0.32
Spiophanes bombyx							1				0.10	0.00	0.32
Streblospio benedicti			1	7	11	5	4	4		5	3.70	4.00	3.59
unidentified Spionidae		1									0.10	0.00	0.32
Cirratulus cirratus		2		9	47	23			2	13	9.60	2.00	15.10
Cirratulus sp.	1	9	3	7							2.00	0.00	3.33
Cirriformia spirabranchia	8	5	1		32	33			2	4	8.50	3.00	12.91
Tharyx cf. monilaris					1						0.10	0.00	0.32
unidentified Cirratulidae							4	5			0.90	0.00	1.91
Capitella capitata	6	3	11	16	15	28	17	60	28	48	23.20	16.50	18.34
Heteromastus filobranchus									1		0.10	0.00	0.32
Cossura pygodactylata					1				1		0.20	0.00	0.42
Tharyx sp.										1	0.10	0.00	0.32
Oligochaeta	2	3	7	27	5	6		3	5	31	8.90	5.00	10.83
Pelecypoda													
Musculus senhousia						2					0.20	0.00	0.63
Tapes japonica									1		0.10	0.00	0.32
Transennella tantilla				1	3	1			1	1	0.70	0.50	0.95
Macoma balthica										1	0.10	0.00	0.32
Macoma nasuta	5	7	1	2	16	7	3	4	8	3	5.60	4.50	4.33
Macoma spp. (juv.)	2	2		1	2	4			4	1	1.60	1.50	1.51
Solen sicarius									1		0.10	0.00	0.32
Crustacea													
Barsiella zostericola									1		0.10	0.00	0.32
Ampelisca milleri		1			3	7		3	2	3	1.90	1.50	2.23
Cancer gracilis			1								0.10	0.00	0.32
Miscellaneous Phyla													
unid. Nemertean							1	1		1	0.30	0.00	0.48

TOTALS	I		II		III		IV		V	
Number of Individuals (for Rep)	24	35	27	71	138	116	30	81	61	113
Number of Species (for Rep)	6	11	8	9	12	10	6	8	16	13
Number of Individuals (for Period)		59		98		254		111		174
Number of Species (for Period)		11		12		13		9		21
Number of Individuals for Station		696								
Number of Species for Station		32								

Shannon-Weiner

Station 10

Number Per 0.05 Meters**2 Per Sampling Period

Species	I		II		III		IV		V		Mean	Median	S. D.
Polychaeta								2			0.25	0.00	0.71
Harmothoe sp.							1				0.13	0.00	0.35
Pholoe minuta									1		0.13	0.00	0.35
Cyptis brevipalpa	6		6				2	3	2		2.38	2.00	2.50
Glycinde sp.	1		1	1			1				0.50	0.50	0.53
Leitoscoloplos pugettensis								1			0.13	0.00	0.35
Streblospio benedicti								2	1	1	0.50	0.00	0.76
unidentified Cirratulidae				3							0.38	0.00	1.06
Capitella capitata									1		0.13	0.00	0.35
Heteromastus filiformis	1										0.13	0.00	0.35
Heteromastus sp.									1		0.13	0.00	0.35
unidentified Maldanidae (juv.)			1								0.13	0.00	0.35
Chone gracilis									1		0.13	0.00	0.35
Chone sp.							1	1			0.25	0.00	0.46
Heteromastus filobranchus							1	1			0.25	0.00	0.46
Harmothoe sp. 2									1		0.13	0.00	0.35
Oligochaeta													
Pelecypoda				4			4	3	4	13	3.50	3.50	4.20
Transennella tantilla	5	2	5					8	9	4	4.13	4.50	3.36
Macoma nasuta				4			1	4	5		1.75	0.50	2.19
Macoma spp. (juv.)									1		0.13	0.00	0.35
Tellina sp. (juv.)										1	0.13	0.00	0.35
Siliqua sp. (juv.)							1				0.13	0.00	0.35
Solen sicarius													
Crustacea		1					5	2	4	8	2.50	1.50	2.93
Ampelisca Milleri							1	5			0.75	0.00	1.75
Crangon nigromaculata													
Miscellaneous Phyla		1									0.13	0.00	0.35
unid. Pleuronectidae (juv.)													

----------TOTALS----------	I		II		III		IV		V	
Number of Individuals (for Rep)	13	4	13	12			18	32	31	27
Number of Species (for Rep)	4	3	4	4			10	11	12	5
Number of Individuals (for Period)	17		25				50		58	
Number of Species (for Period)	6		7				14		13	
Number of Individuals for Station	150									
Number of Species for Station	25									
Shannon-Weiner Species Diversity (H')LN	1.08		1.20				2.12		1.69	

CH2M-HILL
1979

ISLAIS CREEK SEDIMENTS

BENTHIC INFAUNA

NOAA JULY 1985

OF INDIVIDUALS PER 0.1 M^2

SPECIES CODE #	REPLICATE # #1	#2	#3	#4	#5	TOTAL	MEAN	SPECIES
	STATION	IS 02						
1	0	0	1	0	0	1	0.2	Schistomeringos rudolphi
2	2	0	0	0	0	2	0.4	Harmothoe imbricata
17	15	54	56	1	102	228	45.6	Capitella capitata
38	2	1	1	0	0	4	0.8	Ampelisca abdita
41	0	1	0	1	0	2	0.4	Ampelisca hessieri ?
				TOTAL =		237	47.4	
	STATION	IS 05						
3	0	0	0	1	0	1	0.2	Euchone analis
5	0	0	0	0	2	2	0.4	Glycinde picta
17	24	24	115	54	75	292	58.4	Capitella capitata
37	0	0	0	0	1	1	0.2	Turbellaria-Platyhelminthes
41	0	0	0	0	1	1	0.2	Ampelisca hessieri ?
				TOTAL =		297	59.4	
	STATION	IS 09						
5	10	3	1	6	1	21	4.2	Glycinde picta
7	0	0	0	2	0	2	0.4	Sigramba bassa
11	0	2	0	2	0	4	0.8	Leitoscoloplos pugettensis
26	0	0	1	1	1	3	0.6	Gyptis brevipalpa
29	1	1	1	2	0	5	1.0	Nephtys caecoides
33	0	1	1	0	1	3	0.6	Heteromastus filiformis
35	1	0	0	0	0	1	0.2	Cossura soyeri
36	3	1	1	0	1	6	1.2	Streblospio benedicti
38	0	1	0	2	1	4	0.8	Ampelisca abdita
41	0	1	0	2	0	3	0.6	Ampelisca hessieri
44	0	2	0	1	2	5	1.0	Macoma expansa
50	2	2	3	2	2	11	2.2	Macoma nasuta
51	2	1	0	0	0	3	0.6	Lyonsia californica
52	0	1	0	0	0	1	0.2	Transenella tantilla
60	1	0	0	0	0	1	0.2	Amphiurdae (juv.)
63	2	0	0	0	0	2	0.4	Pinnixa sp.
				TOTAL =		75	15.0	

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1986

APPENDIX 3-6

DATE: 23 SEPTEMBER 1985 STATION:ICBS05

	REP1	REP2	REP3	REP4	REP5	MEAN PER 0.05 SQ M	% COMP	MEAN PER SQ M	MEAN PER LITER OF SEDIMENT
ANNELIDA									
Oligochaeta									
Tubificidae	5	10	49	27	22	22.60	21.32	452.00	3.23
Polychaeta									
Amaeana occidentalis	0	5	7	18	0	6.00	5.66	120.00	0.86
Armandia brevis	3	1	0	0	0	0.80	0.75	16.00	0.11
Capitella capitata	8	5	1	0	0	2.80	2.64	56.00	0.40
Chone spp.	0	0	1	0	0	0.20	0.19	4.00	0.03
Cossura pygodactylata	0	1	1	0	0	0.40	0.38	8.00	0.06
Cossura sp. A	0	0	0	1	0	0.20	0.19	4.00	0.03
Euchone limnicola	12	3	5	8	20	9.60	9.06	192.00	1.37
Glycinde polygnatha	0	0	0	2	4	1.20	1.13	24.00	0.17
Harmothoe imbricata	0	0	1	0	2	0.60	0.57	12.00	0.09
Heteromastus filiformis	0	1	0	0	0	0.20	0.19	4.00	0.03
Heteromastus filobranchus	0	0	0	0	1	0.20	0.19	4.00	0.03
Heteromastus spp.	0	0	0	0	1	0.20	0.19	4.00	0.03
Leitoscoloplos pugettensis	0	2	0	2	1	1.00	0.94	20.00	0.14
Mediomastus californiensis	0	0	0	5	2	1.40	1.32	28.00	0.20
Nephtys caecoides	0	0	0	0	2	0.40	0.38	8.00	0.06
Nephtys cornuta franciscana	2	3	2	3	2	2.40	2.26	48.00	0.34
Nephtys spp.	0	1	0	0	0	0.20	0.19	4.00	0.03
Pectinaria californica	0	1	0	1	0	0.40	0.38	8.00	0.06
Pholoe minuta	0	0	0	0	1	0.20	0.19	4.00	0.03
Polydora spp.	0	0	0	0	1	0.20	0.19	4.00	0.03
Polynoidae sp. B	0	8	6	8	0	4.40	4.15	88.00	0.63
Streblospio benedicti	0	0	0	0	1	0.20	0.19	4.00	0.03
Tharyx spp.	0	5	0	2	18	5.00	4.72	100.00	0.71
Unidentified Capitellidae	0	1	0	0	0	0.20	0.19	4.00	0.03
Unidentified Cirratulidae	0	0	1	7	0	1.60	1.51	32.00	0.23
Unidentified Fabricinae	0	0	0	1	0	0.20	0.19	4.00	0.03
CRUSTACEA									
Ostracoda									
Ostracoda sp. A	1	0	0	1	1	0.60	0.57	12.00	0.09
Ostracoda sp. 1	0	0	0	0	1	0.20	0.19	4.00	0.03
Amphipoda									
Ampelisca abdita	2	0	6	4	4	3.20	3.02	64.00	0.46
Grandidierella japonica	0	1	0	0	0	0.20	0.19	4.00	0.03

APPENDIX 3-5

DATE: 23 SEPTEMBER 1985 STATION:ICBS04

	REP1	REP2	REP3	REP4	REP5	MEAN PER 0.05 SQ M	% COMP	MEAN PER SQ M	MEAN PER LITER OF SEDIMENT
ANNELIDA									
Oligochaeta									
Tubificidae	1	9	1	187	88	57.20	64.13	1144.00	8.17
Polychaeta									
Armandia brevis	0	0	0	2	0	0.40	0.45	8.00	0.06
Capitella capitata	16	22	34	0	31	20.60	23.09	412.00	2.94
Cossura sp. A	0	3	0	1	0	0.80	0.90	16.00	0.11
Dorvillea rudolphi	0	2	2	1	8	2.60	2.91	52.00	0.37
Euchone limnicola	0	0	0	1	0	0.20	0.22	4.00	0.03
Glycinde polygnatha	0	0	0	2	1	0.60	0.67	12.00	0.09
Gyptis brevipalpa	0	0	0	1	0	0.20	0.22	4.00	0.03
Heteromastus filiformis	0	0	0	0	1	0.20	0.22	4.00	0.03
Heteromastus filobranchus	0	1	0	0	0	0.20	0.22	4.00	0.03
Nephtys cornuta franciscana	0	0	0	1	0	0.20	0.22	4.00	0.03
Polydora ligni	0	0	0	1	0	0.20	0.22	4.00	0.03
Sigambra bassi	0	0	0	0	1	0.20	0.22	4.00	0.03
Spiophanes berkeleyorum	0	0	0	1	0	0.20	0.22	4.00	0.03
Streblospio benedicti	1	0	0	2	0	0.60	0.67	12.00	0.09
Tharyx spp.	0	1	0	1	3	1.00	1.12	20.00	0.14
CRUSTACEA									
Ostracoda									
Ostracoda sp. A	1	0	0	0	1	0.40	0.45	8.00	0.06
Amphipoda									
Ampelisca abdita	0	2	0	2	2	1.20	1.35	24.00	0.17
MOLLUSCA									
Bivalvia									
Macoma balthica	1	0	0	1	1	0.60	0.67	12.00	0.09
Macoma nasuta	0	1	0	1	0	0.40	0.45	8.00	0.06
Macoma spp.	0	4	0	0	1	1.00	1.12	20.00	0.14
Mysella compressa	0	0	0	1	0	0.20	0.22	4.00	0.03
Mytilidae sp. C	0	0	0	0	1	0.20	0.22	4.00	0.03
Nuculana taphria	0	0	1	0	0	0.20	0.22	4.00	0.03
NEMATODA	0	0	0	0	1	0.20	0.22	4.00	0.03
TOTAL	20	45	37	206	138	89.20		1784.00	12.74
# SPECIES	5	9	4	16	13	22			

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APPENDIX 3-4

DATE: 23 SEPTEMBER 1985 STATION:ICBS03

GASTROPODA									
Odostomia spp.	0	0	1	0	0	0.20	0.10	4.00	0.03
PHORONIDA									
Phoronis pallida	9	0	0	3	1	2.60	1.24	52.00	0.37
TOTAL	258	262	226	88	215	209.80		4196.00	29.97
# SPECIES	16	12	13	17	15	27			

APPENDIX 3. ISLAIS CREEK BENTHIC DATA, SEPTEMBER 1985.

DATE: 23 SEPTEMBER 1985

STATION:ICBS01

	REP1	REP2	REP3	REP4	REP5	MEAN PER 0.05 SQ M	% COMP	MEAN PER SQ M	MEAN PER LITER OF SEDIMENT
ANNELIDA									
Oligochaeta									
Tubificidae	1	1	0	0	2	0.80	5.71	16.00	0.11
Polychaeta									
Capitella capitata	7	6	2	4	8	5.40	38.57	108.00	0.77
Boccardia rodolphi	17	4	2	5	4	6.40	45.71	128.00	0.91
CRUSTACEA									
Insecta									
Unidentified spp.	0	1	0	1	0	0.40	2.86	8.00	0.06
MOLLUSCA									
Bivalvia									
Musculus senhousia	0	0	0	1	0	0.20	1.43	4.00	0.03
Tapes japonica	0	0	1	0	0	0.20	1.43	4.00	0.03
Tellina bodegensis	0	0	2	0	0	0.40	2.86	8.00	0.06
NEMATODA	1	0	0	0	0	0.20	1.43	4.00	0.03
TOTAL	26	12	7	11	14	14.00		280.00	2.00
# SPECIES	4	4	4	4	3	8			

BWPC
1986

APPENDIX 3-2

DATE: 23 SEPTEMBER 1985 STATION: JCBS02

	REP1	REP2	REP3	REP4	REP5	MEAN PER 0.05 SQ M	% COMP	MEAN PER SQ M	MEAN PER LITER OF SEDIMENT
ANNELIDA									
Oligochaeta									
Tubificidae	0	3	3	0	7	2.60	2.67	52.00	0.37
Polychaeta									
Armandia brevis	0	0	1	0	0	0.20	0.21	4.00	0.03
Capitella capitata	74	59	51	42	105	66.20	68.11	1324.00	9.46
Dorvillea rudolphi	4	4	7	3	15	6.60	6.79	132.00	0.94
Chaetozone spp.	0	0	0	0	1	0.20	0.21	4.00	0.03
Eteone californica	0	0	0	0	1	0.20	0.21	4.00	0.03
Euchone limnicola	0	0	2	0	0	0.40	0.41	8.00	0.06
Glycinde polygnatha	0	0	0	2	1	0.60	0.62	12.00	0.09
Harmothoe imbricata	0	0	1	0	0	0.20	0.21	4.00	0.03
Nephtys spp.	0	0	2	0	4	1.20	1.23	24.00	0.17
Polydora ligni	2	4	1	0	4	2.20	2.26	44.00	0.31
CRUSTACEA									
Ostracoda	0	0	0	1	0	0.20	0.21	4.00	0.03
Amphipoda									
Ampelisca abdita	0	0	1	0	0	0.20	0.21	4.00	0.03
Tanaidacea									
Tanais spp.	0	1	0	0	0	0.20	0.21	4.00	0.03
MOLLUSCA									
Bivalvia									
Bivalvia sp. B	0	0	2	0	0	0.40	0.41	8.00	0.06
Macoma balthica	0	9	25	7	16	11.40	11.73	228.00	1.63
Macoma nasuta	12	0	0	0	0	2.40	2.47	48.00	0.34
Mytilidae sp. B	0	3	1	1	2	1.40	1.44	28.00	0.20
Platyodon cancellatus	1	0	0	0	0	0.20	0.21	4.00	0.03
Tellina bodegensis	0	0	0	1	0	0.20	0.21	4.00	0.03
TOTAL	93	83	97	57	156	97.20		1944.00	13.89
# SPECIES	5	7	12	7	10	20			

DATE: 23 SEPTEMBER 1985 STATION:ICBS03

	REP1	REP2	REP3	REP4	REP5	MEAN PER 0.05 SQ M	% COMP	MEAN PER SQ M	MEAN PER LITER OF SEDIMENT
ANNELIDA									
Oligochaeta									
Tubificidae	185	184	173	54	187	156.60	74.64	3132.00	22.37
Polychaeta									
Armandia brevis	1	0	0	0	0	0.20	0.10	4.00	0.03
Euchone limnicola	12	7	6	2	5	6.40	3.05	128.00	0.91
Glycinde polygnatha	2	2	4	1	1	2.00	0.95	40.00	0.29
Harmothoe imbricata	0	0	0	1	1	0.40	0.19	8.00	0.06
Heteromastus filiformis	0	0	0	1	0	0.20	0.10	4.00	0.03
Heteromastus filobranchus	0	1	0	0	1	0.40	0.19	8.00	0.06
Mediomastus californiensis	0	0	0	1	0	0.20	0.10	4.00	0.03
Nephtys caecoides	1	2	0	0	1	0.80	0.38	16.00	0.11
Nephtys cornuta franciscana	0	0	0	1	0	0.20	0.10	4.00	0.03
Nephtys spp.	1	1	0	2	0	0.80	0.38	16.00	0.11
Pectinaria californiensis	1	0	0	0	0	0.20	0.10	4.00	0.03
Polydora ligni	1	0	0	0	0	0.20	0.10	4.00	0.03
Polynoidae sp. B	0	0	1	0	0	0.20	0.10	4.00	0.03
Streblospio benedicti	20	18	15	2	6	12.20	5.82	244.00	1.74
Unidentified Orbiniidae	0	0	1	0	0	0.20	0.10	4.00	0.03
CRUSTACEA									
Ostracoda									
Ostracoda sp. A	5	1	0	3	0	1.80	0.86	36.00	0.26
Amphipoda									
Ampelisca abdita	5	1	4	0	2	2.40	1.14	48.00	0.34
Photis brevipes	0	0	1	0	0	0.20	0.10	4.00	0.03
Copepoda									
Cyclopoida	0	0	0	1	0	0.20	0.10	4.00	0.03
Harpacticoida	0	0	0	0	1	0.20	0.10	4.00	0.03
MOLLUSCA									
Bivalvia									
Bivalvia sp. B	1	0	0	2	2	1.00	0.48	20.00	0.14
Cryptomya californica	1	0	0	0	0	0.20	0.10	4.00	0.03
Macoma balthica	20	43	18	16	0	19.40	9.25	388.00	2.77
Macoma nasuta	2	2	0	1	2	1.40	0.67	28.00	0.20
Macoma spp.	0	0	1	0	6	1.40	0.67	28.00	0.20
Mysella compressa	0	0	2	0	0	0.40	0.19	8.00	0.06
Mytilidae sp. B	0	0	1	0	0	0.20	0.10	4.00	0.03
Mytilidae sp. C	0	1	0	1	1	0.60	0.29	12.00	0.09
Tellina modesta	0	0	0	0	1	0.20	0.10	4.00	0.03
Tellina spp.	0	0	0	1	0	0.20	0.10	4.00	0.03

DATE: 23 SEPTEMBER 1985 STATION:IC2S05

MOLLUSCA

Bivalvia									
Bivalvia sp. B	0	1	2	1	0	0.80	0.75	16.00	0.11
Macoma balthica	0	1	0	0	0	0.20	0.19	4.00	0.03
Macoma nasuta	0	0	0	1	1	0.40	0.38	8.00	0.06
Macoma spp.	1	0	14	12	17	8.80	8.30	176.00	1.26
Mysella compressa	3	18	37	46	40	28.80	27.17	576.00	4.11
Mytilidae sp. B	0	1	0	0	0	0.20	0.19	4.00	0.03
Mytilidae sp. C	0	1	2	0	2	1.00	0.94	20.00	0.14
Mytilidae sp. D	1	0	0	0	0	0.20	0.19	4.00	0.03
Nuculana taphria	0	0	0	1	0	0.20	0.19	4.00	0.03
Protothaca spp.	0	0	1	0	0	0.20	0.19	4.00	0.03
GASTROPODA									
Odostomia spp.	0	1	0	0	0	0.20	0.19	4.00	0.03
TOTAL	37	68	133	142	150	106.00		2120.00	15.14
# SPECIES	10	21	16	20	22	36			

BWPC
1986

APPENDIX

F

CROSSTOWN TRANSPORT

CROSSTOWN TRANSPORT

MAY 1974 MASTER PLAN EIS

The purpose of the Crosstown Tunnel given in the 1974 Environmental Impact Statement for San Francisco"s Wastewater Master Plan (Master Plan EIS) was "...to transport all storm and sanitary waste from the north and east portions of the City to the Lake Merced area." The tunnel as then conceived also would have provided a significant portion of the total storage capacity needed for combined sewer overflow control for the bayside of the City. It would have originated near the North Point Water Pollution Control Plant, ran southerly to the vicinity of the Southeast Water Pollution Control Plant, then headed westerly to the then proposed 1000 MGD, wet-weather Southwest Water Pollution Control Plant. (The dry-weather portion of this plant has been renamed as the Oceanside Water Pollution Control Plant and is currently under construction on the same site.) The first phase of the tunnel (North Point to Southwest) would have been part of the Stage III facilities under the four stage implementation scheme described in the EIS. The second phase of the tunnel (Southeast connection and additional in-tunnel storage as needed for CSO control) would have been part of the Stage IV facilities. The EIS did not contain cost estimates for individual facilities, other than the Stage I facilitates.

The Master Plan EIS was a general concept document with provisions for response to changing circumstances. "It is not possible or even desirable to fully define the Master Plan at this time; too many changes in land use, wastewater treatment technology, and construction costs will take place in the next few years" (EIS pg.4).

1979 SOUTHWEST WATER POLLUTION CONTROL PLANT FACILITIES PLAN

In 1977, the Clean Water Program retained Metcalf and Eddy to undertake facilities planning for the proposed Southwest (Oceanside) Water Pollution Control Plant. In order to develop the optimum size of the Oceanside Water Pollution Control Plant, the Program directed Metcalf and Eddy to reassess the functions and capacities of the Crosstown Tunnel. In their 1979 Project Report for the Southwest Water Pollution Control Plant, Metcalf and Eddy recommended export of 320 MGD of Bayside wet-weather flow to the Southwest Water Pollution Control Plant for treatment (total Southwest Water Pollution Control Plant capacity of 450 mgd). Their Crosstown Tunnel would have had a finished (inside) diameter of 13 to 14 feet with two major compartments, one for conveying 320 MGD of raw Bayside wet-weather flow to the Southwest Water Pollution Control Plant for treatment, the other for conveying 140 MGD of effluent from Southeast Water Pollution Control Plant directly to the Southwest Ocean Outfall for disposal. The tunnel would also have had one or more small diameter lines for conveying Southwest Water Pollution Control Plant sludge to the Southeast Water Pollution Control Plant for sludge treatment. Metcalf and Eddy estimated project costs (their project costs converted to ENR 5517) for the tunnel at $209 million.

1982 BAYSIDE FACILITIES PLAN

In 1979, the joint venture consultant team of Caldwell-Gonzales-Tudor-Kennedy began facilities planning for the Bayside wet-weather facilities (all Bayside wet-weather facilities south of the Mission Creek (Channel) facilities). Caldwell-Gonzales-Tudor-Kennedy developed the store-treat concept whereby the Islais Creek facilities would serve both as storage for CSO control and as primary treatment of the captured combined flows. This concept would have allowed all treatment of Bayside wet-weather flow to occur on the Bayside of the City, thereby eliminating the need for compartmentalization of the Crosstown tunnel. The Crosstown Tunnel design Caldwell-Gonzales-Tudor-Kennedy recommended would have had a finished diameter of 9 to 10 feet with a peak-wet-weather-flow capacity of 460 mgd. Their estimated project costs (converted to ENR 5517) were $269 million.

TWO-CORE SYSTEM

During the course of developing the original Bayside Facilities Plan, federal Clean Water grant funds available for San Francisco's projects declined sharply, in part due to cutbacks in Congressional funding and in part due to the need to fund major projects in Southern California. The anticipated reductions in flow of grant assistance led the Clean Water Program to reevaluate the concepts and staging of the remaining Master Plan facilities. This reevaluation led to the development of the Two-Core concept described in the Program's 1980 Application for Revised Compliance Schedules and subsequent submittals. The two key concepts of the Program's Two-Core and subsequent staging proposals (e.g. Municipal Compliance Plan) are: (1) first priority are projects needed for compliance with the provisions of the Clean Water Act and (2) avoiding major expenditures for projects that could become obsolete upon an ultimate completion of the Master Plan Concept to discharge all dry-weather and the majority, or all, Bayside wet-weather effluents to the Ocean.

BAYSIDE III FACILITIES PLANNING

The Program is currently engaged in facilities planning for the Bayside III facilities. These facilities will consist of; (1) facilities to convey captured CSO flows from the Islais Creek facilities to the Southeast Water Pollution Control Plant for treatment (2) additional wet-weather treatment capacity at, or near, the Southeast Water Pollution Control Plant (3) system enhancements to better utilize the Northpoint Water Pollution Control Plant and (4) additional disposal facilities to fully achieve the Regional Water Quality Control Board's discharge requirements.

As part of the planning for additional disposal facilities, the Program is reassessing the issue of Bay versus Ocean disposal of the effluent from the Southeast Water Pollution Control Plant. This reassessment is partially in response to an earlier reassessment which indicated that with Bayside treatment of Bayside combined flows, Bayside disposal of the resulting effluent could be significantly cheaper than export to the ocean.

The Clean Water Program is considering four basic alternatives; discharge of all Bayside effluent to the Bay, export of only dry-weather effluent from the Southeast Water Pollution Control Plant to the Southwest Ocean Outfall through a 78-inch diameter force main, export of all Southeast Water Pollution Control Plant effluent to Southwest Ocean Outfall through a 9 foot diameter tunnel, and export of all Bayside effluent to Southwest Ocean Outfall through a 9 foot diameter tunnel. The Clean Water Program's latest cost estimates for the Crosstown Transport are $168 million for a tunnel and $83 million for a 78-inch force main.

The Bayside III CSO transport and treatment facilities (items (1), (2) and (3) in the first paragraph) are all needed to achieve the Regional Board's CSO control requirements, regardless of the point of ultimate effluent disposal. These facilities are the only facilities needed to implement the interim use of the Quint Street Outfall for wet-weather effluent disposal.

ATTACHMENT 2

EXCERPT OF

"ISLAIS CREEK PUMP STATION PROJECT, SOUTHEAST WATER POLLUTIO N CONTROL PLANT, SITE HISTORY REVIEW," GEO/RESOURCE CONSULTANT INC.,DECEMBER 1989

1514-000-00

Islais Creek Pump Station Project
Southeast Water Pollution Control Plant
San Francisco, California

SITE HISTORY REVIEW

Prepared for:

San Francisco Clean Water Program

December 18, 1989

Geo/Resource Consultants, Inc.

GEOLOGISTS / ENGINEERS / ENVIRONMENTAL SCIENTISTS
851 HARRISON STREET, SAN FRANCISCO, CALIFORNIA 94107

Geo/Resource Consultants, Inc.
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REGIONAL OFFICES
SAN FRANCISCO
SEATTLE
TUCSON/PHOENIX
WASHINGTON, D.C.

December 18, 1989
1514-00-0

Mr. Stanford Snoek, P.E.
SAN FRANCISCO DEPARTMENT OF PUBLIC WORKS
Industrial Waste Division
750 Phelps Street
San Francisco, California 94124

**RE: SITE HISTORY REVIEW
PROPOSED ISLAIS CREEK PUMP STATION PROJECT
SAN FRANCISCO, CALIFORNIA**

Dear Mr. Snoek:

Geo/Resource Consultants, Inc. (GRC) is pleased to submit this correspondence regarding the aforementioned project. GRC has prepared the "SITE HISTORY REVIEW" Report for the Islais Creek Pump Station Project site. The project included a review of aerial photographs, Sanborn Fire Insurance Maps, leaking underground storage tank sites, and hazardous materials and waste sites.

GRC certifies that the information presented in the "SITE HISTORY REVIEW" Report are representative of conditions that exist at the site, at the time the Report was submitted. Additionally, the information contained within the GRC Report is accurate and complete.

If you have any questions regarding the Report or any other aspect of the program, please feel free to give me a call. Thank you for your continued support.

Sincerely,
GEO/RESOURCE CONSULTANTS, INC.

Peter H. Bailey
Staff Hydrogeologist

Mary L. Loo
Staff Environmental Scientist

Gregory T. Carbullido, R.E.A.
Principal, Environmental Program Divisions

REGISTERED ENVIRONMENTAL ASSESSOR
GREGORY T. CARBULLIDO
No. 1033
Expires 9/30/90
STATE OF CALIFORNIA

GTC/MLL:tva

1514F: 1514LT

SITE HISTORY REPORT

FOR THE

ISLAIS CREEK PUMP STATION PROJECT

San Francisco, California

Prepared for:

CITY AND COUNTY OF SAN FRANCISCO
SAN FRANCISCO CLEAN WATER PROGRAM

Prepared by:

GEO/RESOURCE CONSULTANTS, INC.

851 Harrison Street

San Francisco, California 94107

Job number: 1514-00-0
December 18, 1989

1514F: RC

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LIST OF APPENDICES

1.0 INTRODUCTION

A Site History Review was conducted by Geo/Resource Consultants, Inc. (GRC) for the proposed expansion of the Southeast Water Pollution Control Plant - Islais Creek Pump Station Project Site (Project site) in the City of San Francisco, California (See Figure 1). The tasks completed for the Site History Report included: a site walk-through of the Project site and the designated study area (See Figure 2), to visually identify potential contaminant sources; an aerial photograph interpretation and Sanborn Fire Insurance Map review, to ascertain historical land usage during the past 40 years; a regulatory agency record review to identify operations and facilities within the Limit of Study that could potentially impact the Project site; and the submittal of a proposed sampling program based upon the information compiled from the above mentioned tasks.

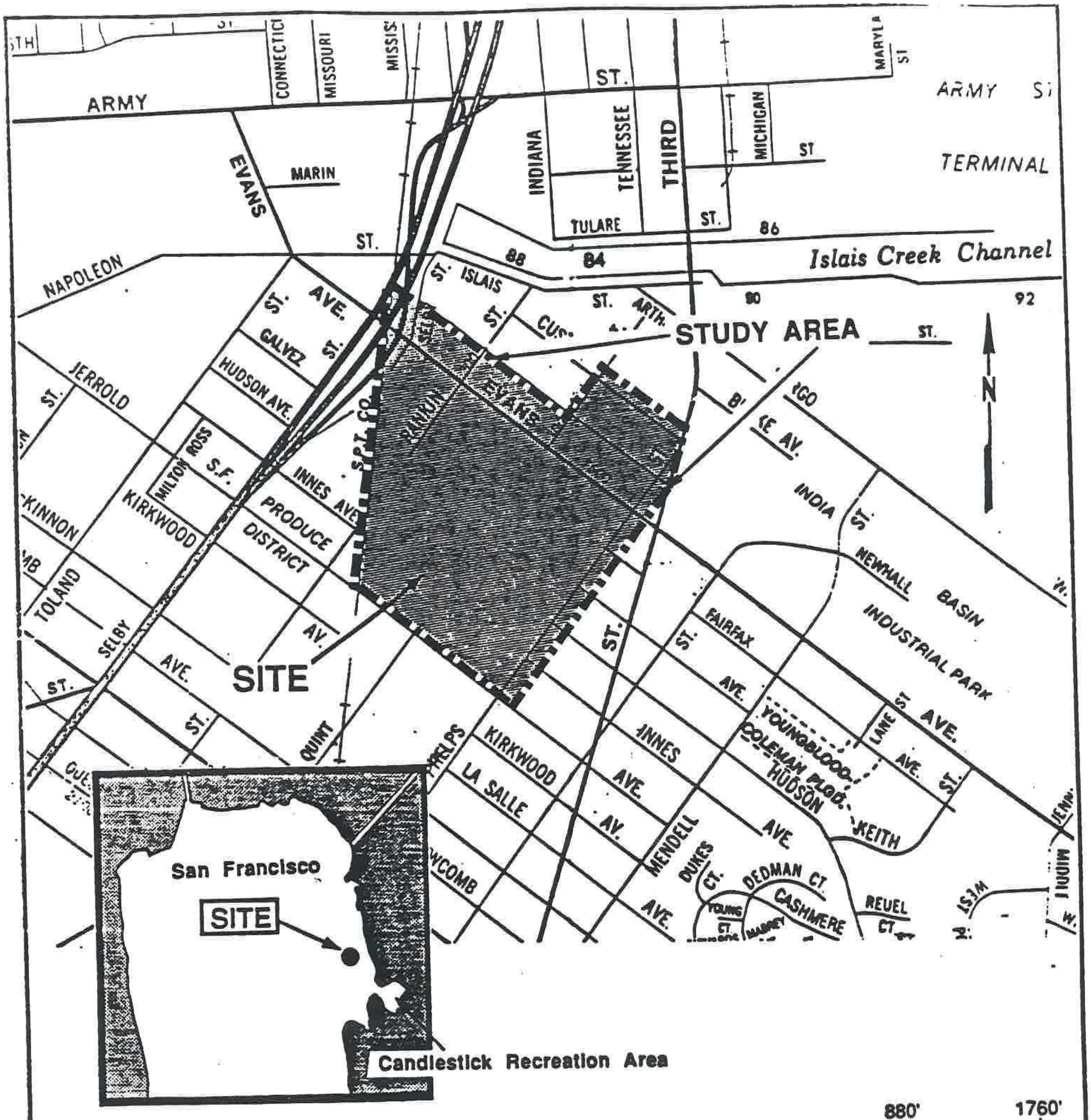
The Site History Report was completed in compliance with the San Francisco Public Works Code, Article 20 (Maher Ordinance). A detailed description of technical personnel involved in the compilation and preparation of the Site History Report is provided in Appendix A.

The Site History Report will present available information and data regarding environmental conditions which may impact the Project site. The contents of this Site History report are limited to the cooperation and availability of information provided by respective agencies. This Report has been prepared and presented in an accurate and objective manner, based solely on the data collected from the respective sources and agencies.

2.0 SITE DESCRIPTION

2.1 Limits of Study

As stated in the "Procedure For Site History" of the San Francisco Department of Public Works (DPW) Regulations for Analyzing Soil For Hazardous Wastes Procedure (November 19, 1986), the Limits of Study will include land and properties one hundred (100) feet outside the perimeter of the proposed Project site. For the purposes of the Site History Review, this area, described in Section 2.2 and detailed on Figure 3, is referred to as the Study Area.



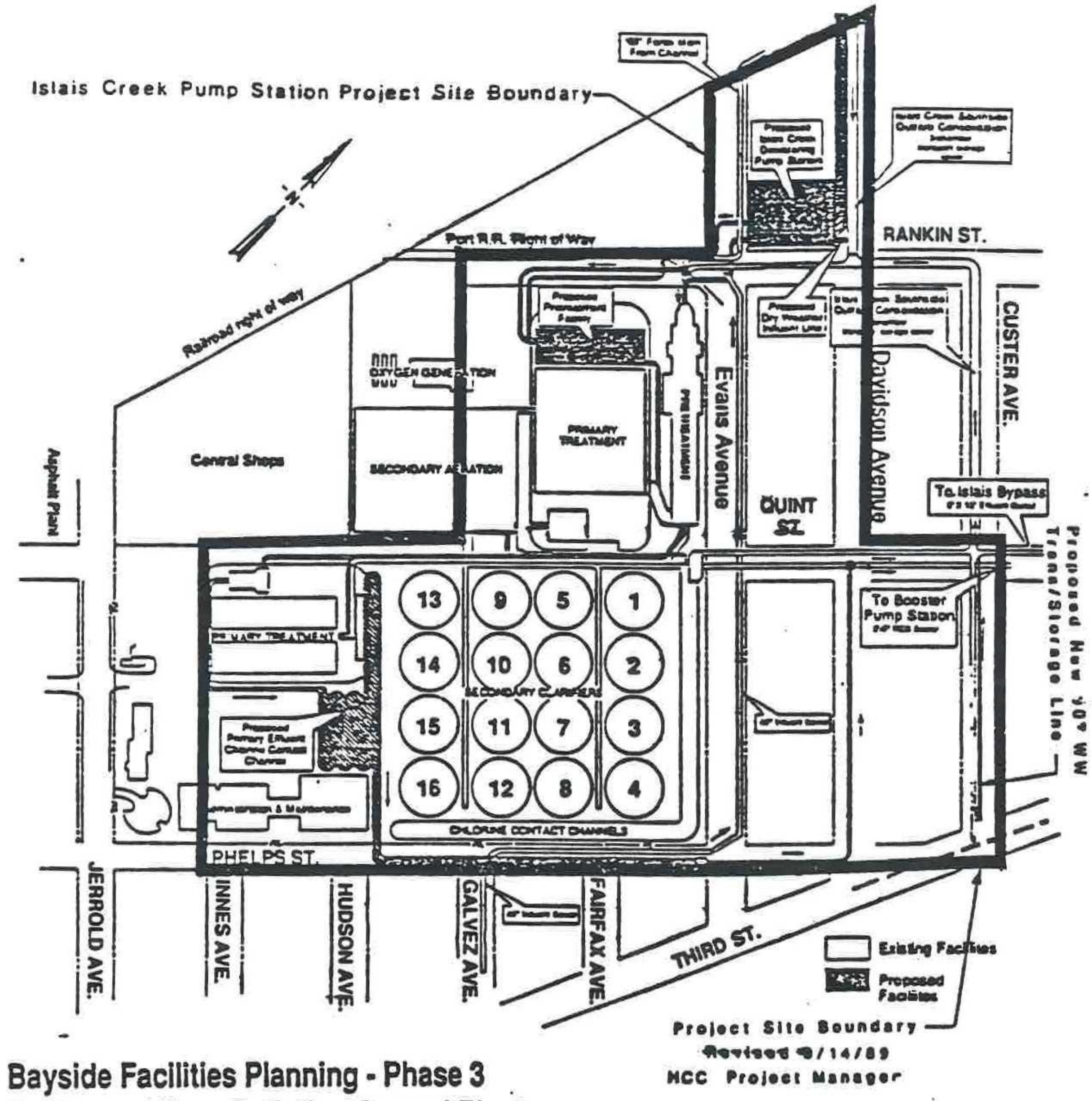
Reference: California State Automobile Assoc., 1988

Geo/Resource Consultants, Inc.
GEOLOGISTS / ENGINEERS / ENVIRONMENTAL SCIENTISTS
851 HARRISON STREET, SAN FRANCISCO, CALIFORNIA 94107

Job No. 1514-00 Appr. [signature] Date 12/18/89

GENERAL VICINITY MAP
Islais Creek Pump Station Project
Southeast Water Pollution Control Plant
San Francisco, California

FIGURE 1



Bayside Facilities Planning - Phase 3
Southeast Water Pollution Control Plant
250 MGD Primary Maximization

Reference: San Francisco Dept. of Public Works
Clean Water Program, 1989

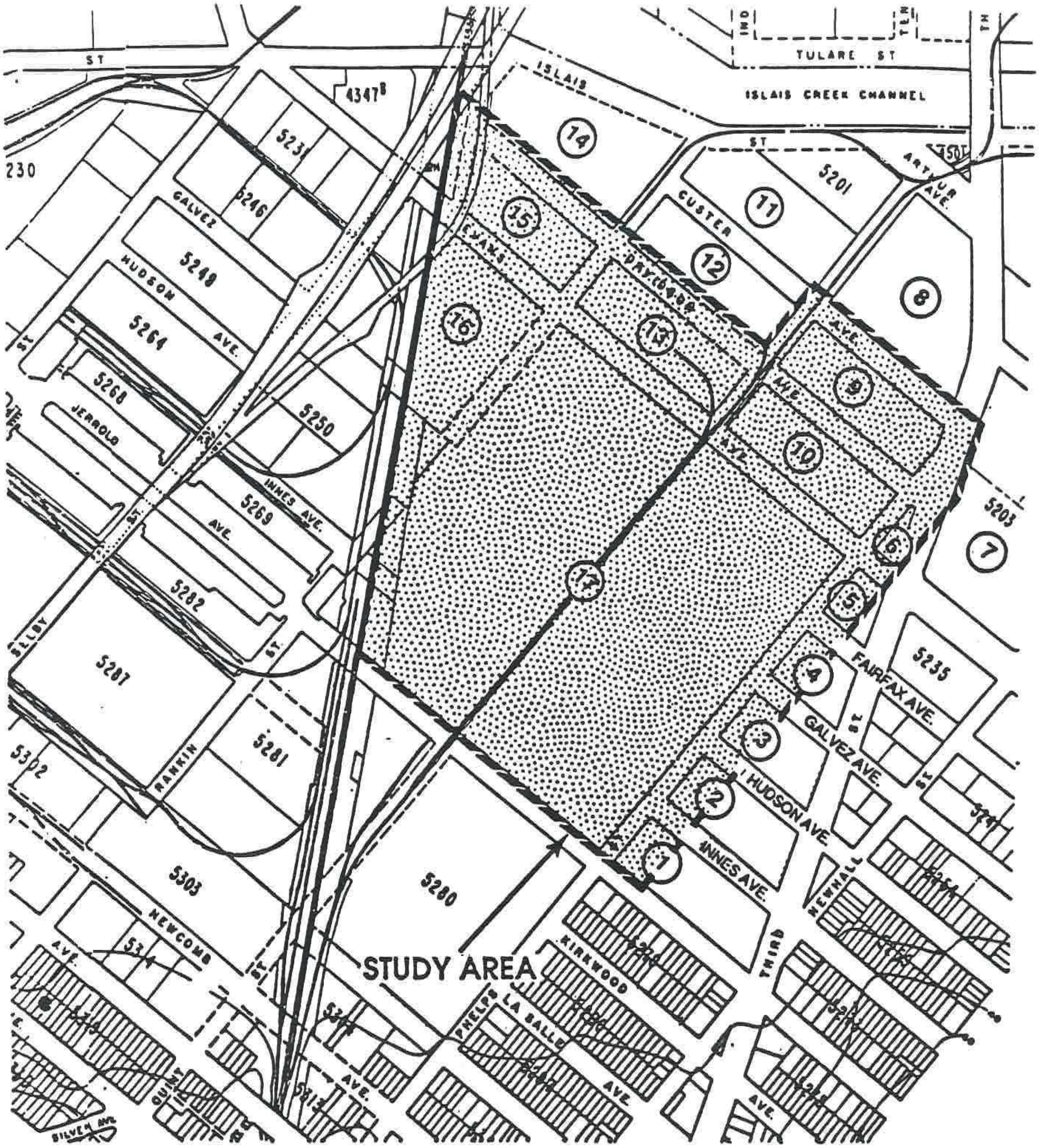
Geo/Resource Consultants, Inc.
GEOLOGISTS / ENGINEERS / ENVIRONMENTAL SCIENTISTS
851 HARRISON STREET, SAN FRANCISCO, CALIFORNIA 94107

Job No. 1514-00 Appr. [illegible] Date 12/18/89

PROJECT SITE MAP
Islais Creek Pump Station Project
Southeast Water Pollution Control Plant
San Francisco, California

FIGURE 2

DATAPRINT N09994



Reference: Planning Department, City & County of San Francisco

N

0 260'

SCALE (Approx.)

Geo/Resource Consultants, Inc. GEOLOGISTS / ENGINEERS / ENVIRONMENTAL SCIENTISTS 851 HARRISON STREET, SAN FRANCISCO, CALIFORNIA 94107	**SITE MAP** Islais Creek Pump Station Project Southeast Water Pollution Control Plant San Francisco, California	**FIGURE** **3**
Job No. 1514-00 Appr. Q Date 12/18/89		

DATAPRINT N?

2.2 Site Description

The Project site is located within the San Francisco City Limits, approximately two miles north of the Candlestick Recreational Park area, east of Interstate 280. The existing Southeast Water Pollution Control Plant (Southeast WPCP) facility consists of approximately 30 acres of land owned by the City and County of San Francisco and maintained by the San Francisco Department of Public Works. The facility is currently bounded to the northeast by Evans Avenue, to the southwest by Jerrold Avenue, to the southeast by Phelps Street, and to the northwest by Rankin Street. According to a map provided by the City and County of San Francisco Department of Public Works, Industrial Waste Division, which delineates the proposed expansion of the sewage treatment facility (See Figure 2), the primary area of the proposed expansion is located along the northwest to southeast border of the existing site. Therefore, in accordance with the Limits of Study stipulated by Article 20 (Maher Ordinance), the study area, with the inclusion of the proposed expansion areas, is bounded to the north by Davidson and Custer Avenue, to the south by Jerrold Avenue, to the east by Phelps Street and to the west by Southern Pacific Railroad Right-of-Way.

2.3 Identification of Study Area by Assessor Parcel Number

The table presented below lists the areas included within the study area by Assessor Parcel Numbers (APN) as described by the City and County of San Francisco Assessor's Office. These identification numbers are presented in accordance with the Site History Review requirements of the Maher Ordinance.

The block numbers (1 through 17) were assigned arbitrarily by GRC to the parcels (See Figure 3) for reference in the subsequent sections and discussions of the Site History Review. The information below includes the APN and a brief description of the block location by street boundaries listed to the north, south, west and east directions.

Block No.	Assessor's Parcel No.	Street Boundaries
1	5272	Innes Avenue, Jerrold Avenue, Phelps Street, Third Street.
2	5260	Hudson Avenue, Innes Avenue, Phelps Street, Third Street.
3	5253	Galvez Avenue, Hudson Avenue, Phelps Street, Third Street.

4	5242	Fairfax Avenue, Galvez Avenue, Phelps Street, Third Street.
5	5235	Evans Avenue, Fairfax Avenue, Phelps Street, Third Street.
6	5225	Davidson Avenue, Evans Avenue, Phelps Street, Third Street.
7	5203	Burke Street, Evans Avenue, Third Street, Newhall Street.
8	5211	Arthur Avenue, Custer Avenue, Quint Street, Third Street.
9	5217	Custer Avenue, Davidson Avenue, Quint Street, Phelps Street.
10	5226	Davidson Avenue, Evans Avenue, Quint Street, Phelps Street.
11	5212	Islais Street, Custer Avenue, Rankin Street, Quint Street.
12	5216	Custer Avenue, Davidson Avenue, Rankin Street, Quint Street.
13	5227	Davidson Avenue, Evans Avenue, Rankin Street, Quint Street.

14	5215	Islais Street, Davidson Avenue, Selby Street, Rankin Street.
15	5228	Davidson Avenue, Evans Avenue, Selby Street, Rankin Street.
16	5232	Evans Avenue, Galvez Avenue, SPRR Right of Way, Rankin Street.
17	5262	Evans Avenue, Jerrold Avenue, Rankin Street, Phelps Street.

2.4 Site Walk-through Observations

GRC personnel completed a site walk-through of the study area on August 24 and September 6, 1989. The walk-through was conducted to provide a preliminary visual assessment of potential hazardous materials and/or hazardous waste impacts occurring within the Limits of Study that may affect the Project site.

The site walk-through commenced on Phelps Street, continued in a counterclockwise direction northward to Custer Avenue, to the west towards Selby Street and the Southern Embarcadero Freeway, to the south along Jerrold Avenue, and terminated at the intersection of Jerrold Avenue and Phelps Street. This site reconnaissance is discussed by block numbers previously assigned in Section 2.3. Each facility noted during the study area walk-through was researched through the use of regulatory agency records. These records were reviewed for information regarding the use, storage and/or manufacturing of hazardous materials and hazardous wastes. Hazardous materials and hazardous waste information procured from the environmental agencies is discussed in Section 3.0.

The general study area vicinity is primarily industrial with numerous operations including automobile parts sales shops, repair shops, numerous wrecking yards, warehouse storage facilities, gasoline service stations and the Southeast Water Pollution Control Plant (Southeast WPCP).

BLOCK 1

The Asia Company is located at 1675 Jerrold Avenue, on the southeast corner of the Phelps Street/Jerrold Avenue intersection. The building appears to be used for storage, however, no indications of the type of materials used and/or stored within the facility were observed from the exterior of the building.

A corrugated metal warehouse was observed on the northeast corner of Jerrold Avenue and Phelps Street. With the exception of a metal sign noting "Quality Fresh Produce", no physical indications regarding the type of operations conducted at the warehouse could be noted from the exterior of the facility. The facility appeared to be presently unused and/or unoccupied. A loading dock access area is located on Phelps Street. The dock appeared to be currently unused.

A chainlink-fenced alley, used as a vehicle parking area, adjoins the "Quality Fresh Produce" warehouse to an automobile repair warehouse located at 801 Phelps Street. The warehouse, on the southeast corner of Phelps Street and Innes Avenue, is constructed of corrugated metal. Dark oil stains were observed on sewer drain grates located along the Phelps Street/Innes Avenue street curb.

BLOCK 2

A soil stockpile was observed on the northeast corner of Phelps Street and Innes Avenue. The pile, approximately 30 to 40 feet in height by approximately 70 feet in width, was bordered by a cyclone-wood slated fence along Phelps Street and partially enclosed by the fence on Innes Avenue. Based on visual observations, the pile appeared to consist of soil with concrete rubble debris and dried grasses. Earthmoving equipment including a hydraulic lift are stored on the property adjacent to a mobile storage/office unit or trailer. One five-gallon container was observed on the northwest corner of the fenced property. The container was labeled "Solvoil", a paint thinner solution containing mineral spirits. Previous land usage could not be discerned from visual observations.

Mail Service of San Francisco maintains a storage warehouse adjacent to the sand stockpile at 701 Phelps Street for the company's automobiles and equipment.

BLOCK 3

California Brake and Clutch Parts Inc., located on the corner of Hudson and Phelps Streets at 1698 Hudson Street, is an automobile brake and clutch parts dealer.

Based on conversations conducted with All Import Auto Dismantlers, Inc. personnel during the site walk-through, a refrigerator storage warehouse (former location of Keystone Batteries, Inc.) is located on the corner of Galvez Avenue and Phelps Street at 1695 Galvez Avenue. The delapidated cinderblock building did not appear to be occupied at the time of the site walk-through. Access to the warehouse appeared to be limited to a single-door entrance and a cargo loading area. Various automobile parts and interiors, apparently from the All Import Auto Dismantlers, Inc., are stored along the outside of the warehouse. (See Section 4.2 Underground Storage Tanks).

BLOCK 4

All Import Auto Dismantlers, Inc., at 525 Phelps Street is a company specializing in the on-site storage and resale of used automobile components.

Paint fumes were detected emanating from overhead vents on the exterior of the Armstrong Kitchens facility at 1595 Fairfax Avenue. Visible (slight) staining of the wall, with heavier concentrations in the vent area, was observed on the wall of the building.

BLOCK 5

A warehouse (company/agency name and site address not identified) containing scaffolding, large piping, and four 55-gallon containers was noted on the southwest portion of Block 5. Two of the four containers appeared unlabeled, however, one 55-gallon container labeled "hydraulic oil", and a second container was labeled "motor oil".

Approximately eight above ground dispensers and four 55-gallon containers were noted at the UNOCAL Service Station. The gasoline station is located on the southeast corner of Evans Avenue and Phelps Street. (See Section 4.3 Underground Storage Tank Fuel Leaks).

BLOCK 6

A Shell Gasoline Service Station occupies the small block bordered by Davidson Avenue and Third Street. The operation sells regular, unleaded and premium unleaded gasoline and diesel fuel products. (See Section 4.2 Underground Storage Tanks)

BLOCK 7

Block 7 is occupied by the India Basin Industrial Park. The Park consists of light industrial businesses including the Morgan Equipment Company and Taymor Company.